QUESTION PAPERS
END TERM EXAMINATION
NOVEMBER –DECEMBER, 2019

M.TECH (FT/PT) & PH.D COURSE
1st SEM (FT/PT) 3rd SEM (PT/F/T)
& 5th SEM (PT)

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QUESTION PAPERS FOR M.TECH. I SEMESTER (FT&PT) & III SEMESTER (PT) & Ph.D WORK END TERM EXAMINATION, NOVEMBER-DECEMBER: 2019

I N D E X

Total No. of Pages 2 *Roll No. .....*

Ph.D Applied Mathematics Course Work

END SEMESTER EXAMINATION, *Nov-2019*

AM-501A STOCHASTIC PROCESSES

Time: 3:00 Hours *Max. Marks :100*

Note : Answer all questions by selecting any two parts out of the three set. All questions carry equal marks.

1(a) How do you specify a stochastic process with respect to its parameter and state? Give example of each type. Discuss the application of stochastic process in the study of congestion.

(b Describe Markov processes. Give example of Markov and non-Markov processes. Explain by considering a suitable example how can we deal with a non-Markov process by redefining it as Markov process.

(c) Describe the motion of a particle under unrestricted simple random walk.

2(a) In a random walk with two absorbing barriers, derive p.g.f. of time to absorption conditional on absorption occurring at one of the barrier.

(b) Describe random walk with two absorbing barriers. Explain how does a queueing system in discrete time can be represented like a random walk with two reflecting barriers.

(c) Describe Poisson process. Prove that the number of arrivals per unit time in case of Poisson process converges to its rate λ as t tends to infinity.

3(a) Describe pure death process. Derive its distribution. Further elaborate it by considering a suitable example of your choice.

months. If there are 5 spare such IC's and time from replacement is zero, find the probability that circuit can operational for at least one year. Find this probability if the spa with expected lives of 3.0, 2.5, 2.0, 1.5, and 1.0 months.

(c) What is a renewal process? Derive renewal equation a solution.

4(a) Consider a computer system during a peak load where saturated. Assume that the processing requirement of exponentially distributed with mean m. Assuming that a fixed job is spent performing overhead functions in the operating s the distribution of the number of jobs completed in the interva

(b) People arrive at a bus stop according to a Poisson proces λ_1. Buses arrive at the stop according to a Poisson process wit bus when arrives picks up everybody who is waiting. Find th value and the variance of the number of people who get on a l

(c) A communication source can generate one of the thr messages 0, 1, 2. The transmission is described by $\begin{bmatrix} 0.5 & 0.3 & 0.2 \\ 0.4 & 0.2 & 0.4 \\ 0.3 & 0.3 & 0.4 \end{bmatrix}$. If the initial state probability distributio $p^{(0)} = (0.3, 0.3, 0.4)$. Find $p^{(3)}$ and limiting distribution.

5(a) Describe birth and death process and find its steady state

(b) Define communicating states. Give examples. Prove th *'communication'* in a Markov chain is an equivalence relation

(c) Derive the n-fold convolution of the distribution func number of renewals in a renewal counting process with renew $5t$. Using this find the distribution of the number of rene

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FIRST SEMESTER Ph .D(AM)

END SEMESTER EXAMINATION NOV/DEC- 2019

AM-501B GRAPH THEORY AND PETRI NETS

Time: 3 Hours Maximum Marks: 100

Note: Answer any Five. All questions carry equal marks.

Q1(a) Prove that a connected graph is Eulerian iff it can be decomposed into circuits.

(b) Show that in a complete graph with n vertices, there are (n-1)/2 edge disjoint Hamiltonian circuits, if n is an odd number greater than or equal to 3.

Q2(a) Prove that in any tree, there are at least two pendant vertices.

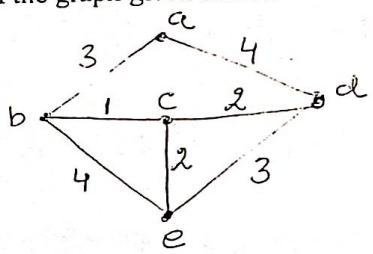
(b) Define binary tree. Prove that

(i) The number of vertices in a binary tree is always odd.

(ii) The number of pendant vertices in a binary tree is (n+1)/2, where n is the number of vertices in the binary tree.

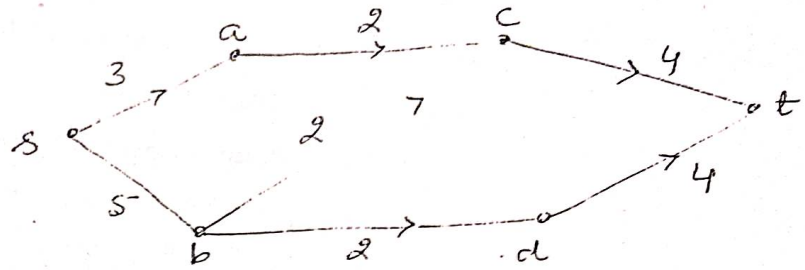
Q3 (a) Prove by induction on number of edges that every graph $G = (V, E)$ has at least $|V| - |E|$ connected components.

(b) Describe Kuruksal algorithm and hence find the minimal spanning tree of the graph given below:



Q4(a) Prove that every circuit has an even number of edges in common with any cut-set.

(b) Using Ford-Fulkerson algorithm find the maximum flow in the network given below:



Q5(a) Prove that the vertex connectivity of a graph cannot exceed the edge connectivity.

(b) Define the Ring sum of two graphs and complement of a graph. Show that a graph is self-complementary if it has 4n or 4n+1 vertices.

Q6(a) Define reachability tree of a Petrinet. Show that the reachability tree of a Petrinet is finite

(b) Prove that a Petrinet is conservative iff there exists a positive vector w such that D. w = 0, where the matrix D has its usual meaning.

END

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Ph.D.

MATHEMATICS

END SEMESTER EXAMINATION

(NOV, 2019)

AM-5016 INTRODUCTION TO MATHEMATICAL SOFTWARE

Time: 3 Hours

Max. Marks: 100

*Note: Attempt **All** questions. All questions carry equal marks. Assume suitable missing data if any.*

1. (a) What is an operating system and discuss at least 3 OS by describing their features.
   (b) Write a short note on the following LINUX commands with suitable illustrations:
   (i) pwd (ii) echo (iii) whoami (iv) vim (v) tty

2. (a) Discuss the following in C programming with suitable examples:
   (i) library function (ii) Escape sequence (iii) array (iv) Output statement
   (v) Input statement
   (b) Write a 'C++' programme to find the solution of a transcendental equation using Bi-section method.

3. (a) Describe the following LaTeXenvironments with example:
   i) Multiline ii) Cases iii) alignment vi) center v) Split
   (b) Write LaTeXcommand for

$$(i) \quad \mathcal{S}_c^* := \left\{ f \in \mathcal{A} : \frac{zf'(z)}{f(z)} \prec 1 + ze^z, \quad z \in \mathbb{D} \right\}$$

$$(ii) \quad T(\theta) := \frac{e^{2\cos\theta}\sin^2(\theta + \sin\theta)}{4(1 + e^{\cos\theta}\cos(\theta + \sin\theta))}.$$

4. (a) Explain with one suitable example the following plots in Mathematica.
   i) Plot ii) PolarPlot iii) ParametricPlot vi) Plot3D v) SphericalPlot3D
   (b) How do we do various integral transforms in Mathematica, explain it with suitable example.

5. (a) Discuss the collect, gather, NSolve, Series command used in Mathematica with an example.
   (b) Write a MATLAB program to determine the root of a quadratic equation.

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ODD SEMESTER

Ph.D.

END SEMESTER EXAMINATION *November 2019*

PAPER CODE: AM-502

MATHEMATICAL MODELING AND SIMULATION

Time: 3:00 Hours *Max. Marks : 100*

Note : Answer all question.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Discuss the types of bifurcations and explain Hopf bifurcation with an example.

Q.2 Discuss the model for motion of a Projectile.

Q.3 What is stability analysis? State the difference between local and global stability of a model. Further, discuss the Routh – Hurwitz criteria.

Q.4 Solve and draw the phase portrait of system of linear differential equation $\dot{X} = AX$ for the following matrices:

[a] $A = \begin{pmatrix} -2 & -1 \\ 4 & -7 \end{pmatrix}$

[b] $A = \begin{pmatrix} 1 & -3 \\ -3 & 1 \end{pmatrix}$

Q.5 Solve the following difference equation:

[a] $u_n = u_{n-1} + u_{n+1}$, given that $u_0 = 1$, and $u_1 = 1$

[b] $u_{n+2} - 4u_{n+1} + 3u_n = 5^n$.

Q.6 Define Lyapunov function and discuss the stability of the system

$\dot{x_1} = -x_2^3$, $\dot{x_2} = x_1^3$ using Lyapunov stability theorem.

Q.7 Discuss the prey – predator model and find its steady state. Also, plot its trajectories.

Q8. Solve a simple SIR model for an epidemic and show the stability of the model with the help of Basic Reproductive number (R_0) and interpret the results biologically.

Q9. Discuss the linear and logistic population growth and decay model for bacteria populations.

Q10. Solve SI model with the consideration of recruitment rate of susceptibles, natural birth and death rates, disease-induced death rate, and other essential parameters. Find the equilibrium of the model and investigate its stability analysis.

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END SEMESTER **Ph.D.(Course Work)**

November, 2019

AM-502 A, APPROXIMATION THEORY

Time: 3 Hours Max. Marks: 100

Note: Attempt any five questions and all the questions are carry equal marks.

(1) (a) Let $f : [0,1] \to \mathbb{R}$ and n is non-negative integer.The Bernstein polynomial of f of degree n is defined as:

$$B_n(f,x) = \sum_{k=0}^{n} p_{n,k}(x) f\left(\frac{k}{n}\right), \quad x \in [0,1],$$

where $p_{n,k}(x) = \binom{n}{k} x^k (1-x)^{n-k}$.

(i) Find the values of $B_n(1,x), B_n(t,x), B_n(t^2,x)$.

(ii) Find the recurrence relation which is as follows:

$$B_n(e_{m+1},x) = \frac{x(1-x)}{n} B_n'(e_m,x) + xB_n(e_m,x),$$

where $e_m = t^m$ and $m \in \mathbb{N} \cup \{0\}$.

(2) Define Baskakov operator and construct its Kantorovich form and using Kantorovich operator evaluate the values of functions $1, t,$ and t^2.

(3) Let f from $C[0,\infty]$ into $C[0,\infty]$ and n is non-negative integer. The Szász-Mirakyan operator is defined as:

$$S_n(f;x) = \sum_{k=0}^{\infty} \alpha_{n,k}(x) f\left(\frac{k}{n}\right) \quad \forall x \in C[0,\infty),$$

where $\alpha_{n,k}(x) = e^{-nx}\frac{(nx)^k}{k!}$.

(i) Find the values of the functions $1, t,$ and t^2.

(ii) Construct its Durrmeyer form and find their moments.

(4) (a) Define Modulus of continuity, and if n is a natural number, then show that $\omega(n\delta) \le n\omega(\delta)$.

(b) State and prove Korovkin's theorem.

(5) (a) State and prove the *Weierstrass* first theorem without help of *Bernstein polynomials* and show that closed interval is necessity of this theorem.

(b) (i) Define briefly

(i) Linear positive operators with examples

(ii) Big$-O$ and small$-o$

(iii) Convex functions

(6) (a) Let Y be a finite-dimensional subspace of a normed linear space X, and suppose that each $x \in X$ has a unique nearest point $y_x \in Y$. Then show that the nearest point map $x \mapsto y_x$ is continuous.

(b) Let Y be a subspace of a normed linear space X, and let $x \in X$. Then show that the set Y_x, consisting of all best approximations to x out of Y, is a bounded convex set.

(7) For a sequence of monotone linear operators on $C[a,b]$, show that the following conditions are equivalent:

(i) $L_n f \to f$ uniformly for all f $C[a,b]$.

(ii) $L_n f \to f$ for $f(x) = 1, x, x^2$.

(iii) $L_n f \to 1$ and $L_\varphi(t) \to 0$ uniformly where $\varphi_t(x) = (t-x)^2$.

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Ph.D.
(NOV, 2019)

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MATHEMATICS

END SEMESTER EXAMINATION

AM-502D, THEORY OF DIFFERENTIAL SUBORDINATION

Max. Marks: 100

Time: 3 Hours

*Note: Attempt **All** questions. All questions carry equal marks. Assume suitable missing data if any.*

1. (a) State and prove Miller and Mocanu theorem..
   (b) If F is an odd convex function, then F is starlike of order $2/\pi$.

2. (a) State and prove Suffridge theorem.Also discuss the case when $a \neq 0$.
   (b) State and prove Theorem of Robertson.

3. (a) State and prove Hallenbeck and Ruscheweyh theorem.
   (b) State and prove any second order linear differential subordination implication involving convex dominant.

4. (a) State and prove Jack's lemma for 3rd order differential subordination.
   (b) Describe Bernoulli's function and find its radius of convexity.

5. (a) Let n be a positive integr and let $\alpha > 0$. If $F \in A_n$ and

$$J(\alpha, F; z) \prec 1 + z + \frac{n\alpha z}{1+z} = h(z), \tag{1}$$

   then $zF'(z)/F(z) \prec 1+z$, and $|zF'(z)/F(z) - 1| < 1$. Also prove if F $\in A_n, \alpha > 0$ and

$$|J(\alpha, F; z)| < M(\alpha, n). \tag{2}$$

   then,

$$|\frac{zF'(z)}{F(z)} - 1| < 1. \tag{3}$$

   (b) State and prove Robertson theorem.

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Ph.D Applied Mathematics Course Work

END SEMESTER EXAMINATION, Nov-2019

AM-503B Information Theory and Coding

Time: 3:00 Hours Max. Marks :100

Note : Answer all questions by selecting any two parts out of the three set in a question. Assume suitable missing data, if any. All questions carry equal marks.

1(a) Derive Shannon's measure of average uncertainty associated with a probability distribution and state and prove its important properties.

(b) Describe mutual information? Discuss its important properties. How can this be considered as a test statistic for assessing the independence between a pair of random variables?

(c) Derive differential entropy for a Gaussian random variable. Show that for a given finite variance σ^2, the Gaussian random variable has the largest differential entropy attainable by any random variable.

2(a) What's the problem of unique decipherability of a code? What are absolutely optimal codes ? When do they exist ? Give two examples in first, there is existence of absolutely optimal binary code, and in second it is not so.

(b) Describe source coding theorem by considering a suitable example of binary codes?

(c) What is block coding ? By considering an example of your choice show that it increases the efficiency of a code.

3(a) Describe a method for the construction of an optimal code. Illustrate by considering an example.

(b) Describe the mathematical model of a DMC. What is a symmetric channel? Find its capacity and hence derive the capacity of a BSC and, a noiseless channel.

(c) What is channel coding theorem? Give its application to a BSC with error transmission probability p. Explain how did that helped to explore the existence of the codes other than the repetition codes.

4(a) Illustrate the basic mathematical structure for the designing of block codes.

(b) Prove that in case of linear block code, $d_{min} = w_{min}$. How does d_{min} determine the error detecting and error correcting capacity of a code?

(c) What is syndrome decoding? What are the properties of syndrom in case of a linear code ?

5(a) For a cyclic code of your choice design a dual code.

(b) Describe BCH codes. Develop a generator polynomial for (15,5) triple error correcting BCH code. What is its d_{min} ?

(c) Explain how do you design parity check matrix of a BCH code. Design the same for the code generated by the generator polynomial obtained in 5(b) above.

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FIRST SEMESTER Ph.D.(Maths)

END SEMESTER EXAMINATION Nov./Dec.-2019

AM-503 C Tensor Analysis and Relativistic Mechanics

Time: 3 Hrs. Max. Marks: 100

Note: Attempt any five questions. All questions carry equal marks. .Assume missing data if any.

1. (a) State Quotient law of tensor and use it to prove that the kronecker delta is a mixed tensor of rank two.

   (b) Define Reimannian metric and show that $g^{ij}dx^i dx^j$ is an invariant.

2. (a) Transform $ds^2 = dx^2 + dy^2 + dz^2$ into spherical coordinate.

   (b) Show that the covariant derivatives of the tensors g_{ij}, g^{ij} *and* δ^i_j all vanish identically.

3. (a) A covariant tensor has components $2x - z$, x^2y, yz in rectangular coordinates. Determine its covariant components in cylindrical coordinates.

   (b) Prove that the Christofell's symbols of first and second kind are not the tensors.

4. (a) Define contraction of tensors and prove that by contraction, the rank of a tensor reduces by 2.

   (b) Define geodesic and obtain their equations with the help of a variation principle. What is a null geodesic?

5. (a) State Hamilton's principle in classical mechanics. What is its covariant form?

   (b) Establish the Einstein tensor $G^i_j = R^i_j - \frac{1}{2}g^i_j R$, where the symbols have their usual meaning. Write the covariant form of Einstein tensor.

(P.T.O.)

6. (a) If $ds^2 = dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta\, d\varphi^2$, find the values of $\Gamma_{22,1}$, Γ^1_{22} *and* Γ^3_{13}.

   (b) Find the components of the first and second fundamental tensors in spherical coordinates.

7. Write a short notes on any two:

   (a) Maxwell's equations

   (b) Hamilton's principle in relativity

   (c) Bianchi Identity

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End Semester Examination
Paper Code: AM-503E
Max Marks: 100

Roll No.: .....
Ph.D. Course, November-2019
Fuzzy Logic and Applications
Time: 3.00 Hours

Note:

- All Questions are compulsory carry equal marks.
- Assume suitable missing data if any.

Q 1. (a) Consider fuzzy sets $\widetilde{A}$ & $\widetilde{B}$ defined on the set of real numbers in the interval $[0, 10]$ with membership function as: (i) $\mu_A(x) = \frac{x}{x+2}$, (ii) $\mu_B(x) = \frac{1}{[1+10(x-2)^2]}$. What do these fuzzy sets physically represent? Evaluate compliment, Union, intersection and Difference of these fuzzy sets.

(b) Let $\widetilde{A} = (1.2, 1.8, 3)$ be a triangular fuzzy number. Compute triangular approximation of $\widetilde{A}^{-1}$. Also, compute error approximation of $\widetilde{A}^{-1}$. Show the result diagrammatically also.

Q 2. (a) i. Consider a fuzzy number characterized by by a triangular fuzzy number $\widetilde{A}$ under $y = x$ that is $f(\widetilde{A}) = \widetilde{B}$. Calculate the image for each interval for which $\mu_A(x)$ is defined as :

$$\widetilde{A}(x) = \begin{cases} 0 & x < 1, x > 5 \\ \frac{x-1}{2} & 1 \leq x \leq 3 \\ \frac{5-x}{2} & 3 \leq x \leq 5 \end{cases}$$

ii. R_1 and R_2 are two fuzzy equivalence relations on a set A of order m then ckeck if $R_1 \cup R_2$, $R_1 \cap R_2$, R_1^{-1} are also fuzzy equivalence relations.

(b) What do you mean by transitive closure of a fuzzy relation $\widetilde{R}(X, X)$. Compute transitive max-min closure $\widetilde{R}_T(X, X)$ for the fuzzy relation $\widetilde{R}(X, X)$ given as:

$$\begin{pmatrix} 0.8 & 0.6 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0.5 & 0 & 0 \\ 0 & 0 & 0.9 & 0 \end{pmatrix}$$

P.T.O.

Q 3. (a) Draw A general scheme of a fuzzy controller and explain.

(b) Let $\tilde{A}_1 = [1,6,7,9]$, $\tilde{A}_2 = [-2,3,5,9]$ and $\tilde{A}_3 = [2,4,7,10]$ are three trapezoidal fuzzy numbers. Perform the following:

i. Aggregate Fuzzy set $\tilde{A}_1$, $\tilde{A}_2$ and $\tilde{A}_3$ and do the defuzzification using Mean of maximum (MOM) method.

ii. Perform ($\tilde{A}_1 + 2\tilde{A}_2 - 5\tilde{A}_3$) and ($\tilde{A}_1 * 3\tilde{A}_3/\tilde{A}_2$).

Q 4. (a) Let $\tilde{A} = [2,5,7,9]$, $\tilde{B} = [-1,3,6,10]$ and $\tilde{C} = [3,6,7,8]$ are three trapezoidal fuzzy numbers. Solve the following equation:

$$\tilde{A}\tilde{X} + \tilde{B} = \tilde{C}$$

(b) Consider the following two discrete fuzzy sets defined on universe $X = \{-5,5\}$

$$\widetilde{A} = \text{“zero”} = \left\{\frac{0}{-2} + \frac{0.5}{-1} + \frac{1}{0} + \frac{0.7}{1} + \frac{0.1}{2}\right\}$$

$$\widetilde{B} = \text{“positive medium”} = \left\{\frac{0.6}{1} + \frac{1.0}{2} + \frac{0.6}{3} + \frac{1.1}{4}\right\}$$

Construct the relation for the rule *If* $\widetilde{A}$, *then* $\widetilde{B}$ (if x is ‘zero’, then y is ‘positive medium’). Calculate $\mu_R(x,y)$ using min-composition.

Q 5. (a) Draw Architecture of an expert system and explain.

(b) Let fuzzy relation $\widetilde{R}(x,x)$ and $\widetilde{Q}(y,y), x \in X, y \in Y$ be defined on the sets $X = \{a,b,c,d\}, Y = \{\alpha,\beta,\gamma\}$ as

$$\widetilde{R}: \begin{pmatrix} 0 & .5 & 0 & 0 \\ 0 & 0 & .8 & 0 \\ 1 & 0 & 0 & .4 \\ 0 & .4 & 0 & 0 \end{pmatrix} \text{ and } \widetilde{Q}: \begin{pmatrix} .6 & .8 & 0 \\ 1 & .8 & 0 \\ 1 & 0 & .8 \end{pmatrix}$$

Let h map a,b of X to α of Y and c of X to β of Y and d of X to γ of Y. Comment whether h is strong homomorphism or not.

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ODD SEMESTER

Ph.D.

END SEMESTER EXAMINATION ***December-2019***

Paper Code: AM-504C

Numerical Methods and Partial Differential Equations

Time: 3:00 Hours *Max. Marks : 100*

Note : Answer all question.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Discuss the consistency and stability of Two Stage Runge-Kutta scheme for advection equation.

Q.2 Find the solution of scalar conservation law by the method of characteristics

$$u_t + au_x = 0$$

$$u(x,0) = u_0(x)$$

Q.3 Discuss the concept of weak solution to

$$u_t + f(u)_x = 0$$

Q.4 Prove the convergence of the explicit scheme

$$\frac{u_{i,j+1} - u_{i,j}}{\Delta t} = \frac{u_{i-1,j} - 2u_{i,j} + u_{i+1,j}}{\Delta x^2}$$

Q.5 Drive the five point formula for 2D Laplace equation and discuss its consistency.

Q.6 Use the Crank-Nicolson method to calculate a numerical solution of

$$u_t = u_{xx} \in (0,1), \quad t > 0$$

$$u(x,0) = 2x \quad 0 \le x \le \frac{1}{2}$$

$$u(x,0) = 2(1-x) \quad \frac{1}{2} \le x \le 1$$

$$u(0,t) = u(1,t) = 0 \quad t > 0.$$

Q.7 Show that the Crank-Nicolson scheme is unconditionally stable.

Q.8 Compute the numerical solution of

$$u_{xx} + 3u_{yy} = -16$$

With boundaries $u = 0$ on $x = \pm 1$, $\frac{\partial u}{\partial y} = -u$ on $y = 1$; $\frac{\partial u}{\partial y} = u$ on $y = -1$.

Q.9 Determine the speed of shock in Burger's equation

$$u_t + \left(\frac{1}{2}u^2\right)_x = 0$$

Q.10 Prove that Lax-Friedrich scheme is conditionally stable for advection equation. Find stability condition.

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otal No. of Pages: 2
DD SEMESTER
ND SEMESTER EXAMINATION

Roll No.....
Ph.D. Course Work
(NOVEMBER-2019)

AM 505B: Advanced Algebra

me: 3:00 Hours **Max. Marks: 100**

ote: All questions are compulsory. Each question carry equal marks. Answer **any two** parts from each question. Assume suitable missing data, if any.

. a) Let D be a division ring and let n be a positive integer. Then, show that the full matrix ring $M_n(D)$ is simple.

b) Show that the order of a simple group can not be $2n$, where n is an odd number greater than 1.

c) Prove that the set *Inn(G)* of all inner automorphisms of G is a normal subgroup of *Aut(G)*..

2. a) Let G be a nontrivial finite p-group, then show that $Z(G) \neq \{1\}$.

b) Let G be a group, let $x, y \in G$ and H be a subgroup of G. Then show that $\sigma[x, y] = [\sigma(x), \sigma(y)]$ for any automorphism σ of G and G' is characteristic subgroup of G.

c) Prove that FC center of a group G is a characteristic subgroup of G.

3. a) State and prove Jordan-Holder Theorem for modules.

b) Give an example to show that a submodule of a free module need not be free.

P.T.O

c) Let $\{M_i\}_{i\in I}$ be a family of submodules of an R-module M such that $M = \oplus_{i\in I} M_i$. For each index $i \in I$, let N_i denote a submodule of M_i and let $N = \oplus_{i\in I} N_i$. Prove that $M/N \simeq \oplus_{i\in I} M_i/N_i$.

a) Let N be a submodule of an R-module M. Then, show that M is Artinian if and only if N and M/N both are Artinian.
b) Let R be a semisimple ring. Prove that a left ideal L of R is minimal if and only if it can be written as $L = Re$, where e is a primitive idempotent of R.
c) State and prove Schur's Lemma.

a) State and prove Nakayama's Lemma..
b) Show that a ring R is semiprime if and only if $P(R) = 0$, where $P(R)$ is the prime radical of ring R.
c) Show that every nilpotent ideal is a nil ideal in a ring R.

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B.Tech./M.Tech./MBA/ Ph. D/B.Tech.[Eve.]

END SEMESTER EXAM (NOVEMBER-2019)

PAPER CODE: AM-505D

TITLE OF PAPER: Quantum Information Theory

Time: 3:00 Hours **Max. Marks: 100**

Note: All questions are compulsory.

All questions carry equal marks.

Assume suitable missing data, if any.

Q1. (i) State and prove the conditions of characterization of density matrices.

(ii) Show that an arbitrary density matrix for a mixed state qubit may be written as

$$\rho = \frac{I + \vec{r}.\vec{\sigma}}{2}$$

where $\vec{r}$ is a real three-dimensional vector such that $\|\vec{r}\| \leq 1$.

Also show that the equality holds for a pure state ρ.

Q2. (i) Prove that a state $|\psi\rangle$ of a composite system AB is a product state if and only if it has Schmidt number 1. Prove that $|\psi\rangle$ is a product state if and only if ρ^A are pure states.

(ii) State singular value decomposition. Find the singular value decomposition of the matrix A, where

$$A = \begin{pmatrix} 3 & 2 & 2 \\ 2 & 3 & -2 \end{pmatrix}$$

Q3. (i) Let $\{E_m\}$ be a POVM, with $p_m \equiv tr(\rho E_m)$ *and* $q_m \equiv tr(\sigma E_m)$ as the probabilities of obtaining a measurement outcome labelled by

END

P.T.O.

m. Then prove that

$$D(\rho,\sigma) = \max_{\{E_m\}} D(p_m, q_m)$$

where the maximization is over all POVMs $\{E_m\}$.

(ii) Define fidelity. Prove that

$$1 - F(\rho,\sigma) \le D(\rho,\sigma)$$

where $F(\rho,\sigma)$ and $D(\rho,\sigma)$ denote the fidelity and trace distance respectively.

Q4. (i) Define concurrence and negativity of a bipartite mixed entangled state. Prove that concurrence and negativity are equal for pure bipartite entangled state.

(ii) Show that negativity is less than concurrence for the density matrix

$$\rho_{AB} = \begin{pmatrix} 1/4 & 0 & 0 & 0 \\ 0 & 0 & 1/2 & 0 \\ 0 & 1/2 & 11/16 & 0 \\ 0 & 0 & 0 & 1/16 \end{pmatrix}$$

Q5. Explain the teleportation protocol using quantum gates.

- END -

Total No. of Pages 02

Roll No.....

FIRST SEMESTER

M.Tech. (Polymer Technology)

END SEMESTER EXAMINATION Nov/Dec-2019

PTE-501 POLYMER CHEMISTRY

Time: 3:00 Hours

Max. Marks : 40

Note : Answer all question by Selecting any two parts from each questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] What is the ionic polymerization? Discuss the mechanism of cationic polymerization. 4

[b] Explain the kinetics of step polymerization and establish the relation as $-d[COOH]/dt = k_3 K [COOH][OH][HA]$ 4

[c] Discuss all the reaction steps involved in the preparation of phenol formaldehyde. 4

Q.2[a] What is the difference between bulk and solution polymerization? Explain it. 4

[b] Elaborate the kinetics of external catalysis of polymerization and derive the following relationship. 4

$$1/(1-p) = 1+ [M]_o k't$$

[c] Differentiate between inhibition and retardation with suitable examples. 4

Q.3[a] What is the role of initiator? Discuss its types with suitable examples. 4

[b] Discuss the kinetics of linear stepwise polymerization in case of self catalyzed polyesterification. 4

[c] Explain any one IUPAC rule for naming single–strand organic polymers with suitable example. 4

P.T.O

Q.4[a] What do you mean by chain termination by chain transfer? Explain it. 4

[b] Discuss the mechanism of coordination polymerization. 4

[c] Describe the kinetics of copolymerization in detail. 4

Q.5 Write short note on any two of the following.

[a] Emulsion polymerization

[b] Kinetics of non-stoichiometric polymerization

[c] Ring opening polymerization 2 x 4

-End-

Total no. of Pages2 *Roll No.....*

1st SEMESTER [M.Tech]

End SEMESTER EXAMINATION (November 2019)

PTEAE-503 Polymer Structure and Properties

Time: 3hour *Max Marks: 40*

Note: Answer all questions
Assume suitable missing data, if any

Q.1 Justify the following statements

a Creep behaviour of polymers is explained by Kelvin Voigt model of viscoelasticity 4

b Mechanical properties of polymeric products depend on glass transition temperature. 4

Q.2 a The relative flow times (t/t0) of poly (methyl methacrylate) polymer in chloroform are given below 6

(a) Determine [η] by plotting ηsp/c against c

(b) Find Mv for this polymer where $K=3.4\times10^{-5}$ and a=0.80

Concentration (g/dl)	t/t0
0.20	1.290
0.40	1.632
0.60	2.026

b Differentiate between Haze and gloss properties of polymeric films. 2

Q.3 a Define the following terms and their significance 4
(a) loss modulus (b) storage modulus

b Discuss the working principle of DSC. Write the applications of DSC in the polymer characterization. 4

Q.4 a Differentiate between shear thinning and shear thickening fluids 2

b What is stress relaxation of polymers? Derive an equation for relaxation modulus using Maxwell model. 6

Q.5 a Discuss the working principle of Rockwell hardness tester. 4

b Discuss the working principle of Gel permeation chromatography 4

-20-

Total No. of Pages 01

Roll No.....

1st SEMESTER

M.Tech.

END SEMESTER EXAMINATION *Nov./Dec.-2019*

(PTE5203) Engineering Concepts in Polymer

Time: 3:00 Hours *Max. Marks : 50*

Note : All questions carry equal marks.

Q.1 [a] Explain the Reynolds experiment and define the Reynolds Number.

[b] Derive the Equation of Continuity in cartesian coordinate system.

Q.2 What are you understand by del operator, alternating unit tensor and kronecker delta? Prove the following Identity.

$$\overline{\nabla}.\bar{v}\overline{w} = \bar{v}.\overline{\nabla}\overline{w} + \overline{w}\overline{\nabla}.\bar{v}$$

Q.3 [a] Develop a mathematical expression to calculate rate constant for a first order reaction.

[b] What are you understand by plug flow reactor? Derive the design equation for plug flow reactor.

Q.4[a]What are you understand by crushers and grinders. Describe the design of jaw crusher and ball mill

[b] Describe the working of a mixture used to mix solid material.

Q.5 Define the following terms

(a) Elementary reaction

(b) Cylindrical coordinate system

(c) 2nd order tensor

(d) Scalar product of two vector.

(e) Auto-catalytic reaction.

Total No. of Pages _2__ Roll No.....

FIRST SEMESTER **M.Tech**

END SEMESTER EXAMINATION ***NOV-2019***

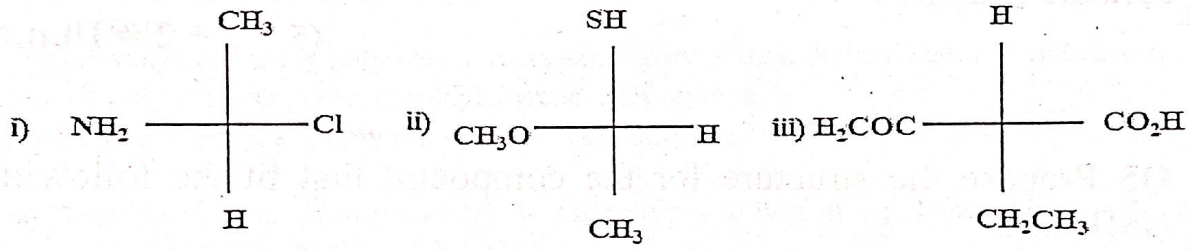
CHEMICAL CONCEPTS IN POLYMERS (PTE 5205)

Time: 3:00 Hours *Max. Marks: 50*

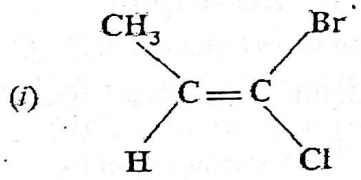
Note : Answer all questions
All questions carry equal marks.
Assume suitable missing data, if any.

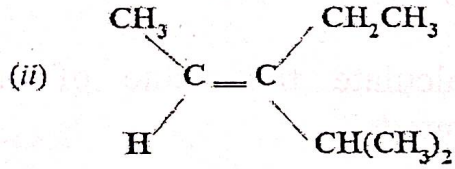
Q. 1 a) Discuss in detail the characteristic feature and stability of carbocation, carbanion and free radical reactive intermediates.

b) Assign R or S configuration to the following molecules showing priorities for various groups:



c) Assign E and Z configuration to the following compounds





(5 + 3 + 2 = 10 marks)

Q2 a) Discuss Newman and Sawhorse representations for conformation of ethane along with their conformational analysis.

b) Differentiate between electrophilic and free radical addition reactions using suitable examples.
c) Define racemic mixture. Give suitable example.

(5 + 3 + 2 = 10 marks)

Q3 a) Discuss the basic principle, instrumentation and application of X-ray diffraction.
b) What is the range of infrared radiations? What happens when a substance is irradiated with infrared radiation.
c) What is an auxochrome? Give an example.

(5 + 3 + 2 = 10 marks)

Q4 a) Define chemical Shift. Distinguish between between shielding and deshielding using suitable example.
b) Draw a block diagram for double beam spectrophotometer and explain its merit over single beam spectrophotometer.
c) Discuss the major applications of UV visible spectroscopy using suitable example.

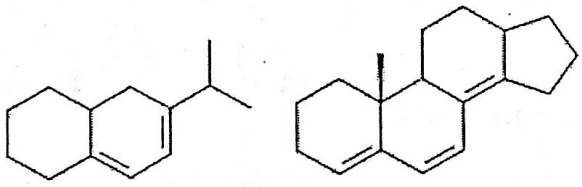
(5 + 3 + 2 = 10 marks)

Q5 Propose the structure for the compound that fit the following ^1H NMR data:

(a) $C_5H_{10}O$
δ 0.95, 6H, doublet
δ 2.10, 3H, singlet
δ 2.43, 1H, multiplet

(b) C_4H_7BrO
δ 2.11, 3H, singlet
δ 3.52, 2H, triplet
δ 4.40, 2H, triplet

b) Calculate the value of absorption maxima for the following compounds.



c) Define mass spectrometry. How one can identify the mixture of isotopes using mass spectrometry. Give suitable example.

(5 + 3 + 2 = 10 marks)

Total No. of Pages 1 Roll No. .....

Ist SEMESTER M.Tech. (Odd)

END SEMESTER EXAMINATION Nov/Dec-2019

PAPER CODE: PTE 5301 TITLE OF PAPER: Polymer Degradation

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer all the **Five** questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] Explain mechanism of photodegradation of PMMA in solid state. 4
[b] Write various reactions involved in initiation of free radical oxidative degradation. 4

Q.2[a] Thermal oxidative degradation of polystyrene yielded an aromatic product 'A'. Elemental analysis revealed its molecular formula C_7H_6O. 'A' exhibited a strong sharp peak at 1709 cm^{-1} in IR spectrum in CCl_4. Identify the degraded product and illustrate its formation. 1,4
[b] With a suitable example write salient features and mechanism of random degradation. 3

Q.3[a] What is the effect of α-amylase on starch molecule? Give an evidence to support your answer. 2½, 2½
[b] Arrange following polymers in increasing order of their thermal stability and give reason:
i) poly ethylene, poly α-methyl styrene, poly styrene
ii) poly carbonate, poly p-phenylene, poly ethylene. 3

Q.4 Describe the role of **any two** of the following additives in a polymer. Give their chemical structure and mechanism of action. **2x4**
[a] Salol
[b] TBC
[c] Epoxidized vegetable oils.

Q.5 Explain **any two** in brief - **2x4**
[a] Mastication of rubber
[b] Ozonolysis of polymers
[c] Depolymerization

END

Total No. of Pages: 01

Roll No. .....

M.Tech. (I) Year

End Semester Examination (Nov. 2019)

PTE-5401 PLASTIC TECHNOLOGY

Time: 3 Hours

Max. Marks: 40

Note: All questions carry equal marks. Answer **any 10** questions.
Assume suitable missing data, if any.

Q1. Starting from the synthesis of the monomer, describe the manufacturing process for PVA.

Q2. What are polyimides? Describe the synthesis of important polyimide derivatives, their processing and applications.

Q3. Discuss the chemical synthesis and properties of PET. Also analyze its biodegradation and recyclability processes.

Q4. Discuss the structure and synthesis of Polycarbonates in detail. Also evaluate their properties and applications.

Q5. What are Polyurethanes? List various components for the synthesis of Polyurethanes. Also discuss the foaming agents and surfactants used in PU foams.

Q6. What are Polyaryletherketones (PAEKs)? Write the expanded names and general structures of PEK, PEEK, PEKK. Also discuss their unique properties and applications.

Q7. How is Teflon synthesized? Describe the emulsion polymerization for Teflon production in detail.

Q8. How are polyacetals classified? Elaborate the manufacturing process and unique applications for POM.

Q9. What are Polyacrylates? Provide a comparative account of the properties and applications of important polyacrylates.

Q10. Discuss the structure, unique properties and applications of <u>any two</u> of the following:

(i) Kevlar (ii) *m*LLDPE (iii) Butyl rubber

Q11. Describe the following:

(a) Nylon Synthesis: Direct route Vs Acid chloride route.
(b) PAN copolymers.

Q12. Write detailed notes on:

(a) Silicones and their applications.
(b) Polysulfones

END

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Total no of pages: 02 *Roll no.....*

END SEMESTER EXAMINATION November-2019

M.Tech (Polymer Technology), 3rd Semester

PAPER CODE AC-701(5)

Commercialization of Polymer & Chemical Technology Products.

Time: 3 Hours *Max. Marks: 100*

Note: Answer total **six** questions, and Question No.1 (20 marks) is compulsory. In addition to Question 1, attempt only any **five** questions (16 marks each) from the rest of ten questions (2-11).

1. You are an entrepreneur with a B. Tech/ M. Tech or PhD degree in polymer & Chemical technology, with Rs. one crore as an initial seed/start money & one acre of land with ½ acre built-up area ready to start your operation. You have to start an enterprise/business/industry of your own.

- What product/service have you identified (just two lines only)?

- You have to submit your business plan. The question is why do you need a business plan and what should be the contents of your business plan (be brief).

2. What are the essential characteristics of an entrepreneur, what is innovation and success equation?

3. For your stat up company you are trying to obtain funding from Venture capitalists, what are the things they are looking for, mention about Due Diligence, ROI, & Exit route etc.

4. What do you understand by the term positioning? Playing position game, what you need to do, understand.

5. As a leader how would you position your company to be successful? The illusion that the power of the product is derived from the power of the organization, what would you like to say on this.

6. Now you are searching for a real-estate/building for your company, what kind of neighbourhood amenities, transportation, parking, tenant–mix, and environmental audit you should consider.

7. There is need for University-Industry technology transfer/alliance. Why a company or university need/seek an alliance and the nature of cultural clash, &, what kind of successful negotiations required

8. For a polymer. Chemical Technology Company to be successful what should be the mission, objectives, goals, strategies & tactics, elaborate your answer.

9. Mention the six secrets of success, and how to build a sustainable business.

10. Let us take the case studies of "Du Pont", "Glaxo Smith Klein" or "Tata Steel", which one company impresses most and what policies or HR practices you would like to emulate in your own company/organization.

11. Let us take the case of Haldiram & Bikaner Bhujia Empire, both food companies in our country, what could you learn from their success stories, in brief.

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Total No. of Pages: 02

THIRD SEMESTER

Roll No. .....

M.Tech.(PT)

PhD

END SEMESTER EXAMINATION *Nov/Dec-2019*

AC-7024 WASTE PLASTIC RECYCLING

Time: 3 Hours *Max. Marks: 100*

Note: Answer any *TEN* questions. All questions carry equal marks. Assume suitable missing data, if any.

[1] Define biodegradables. What are the factors responsible for biodegradation of plastics? Write four applications of biodegradable plastics.

[2] Explain the recycling process of polyamides by taking a suitable example.

[3] What is PET? How will you synthesize PET? Write four applications of recycled PET.

[4] Explain the difficulties caused by additives in plastic recycling or degradation process. List the additives used in plastics.

[5] Discuss the factors on which the Plastic waste recycling depends.

[6] Explain plasma pyrolysis method for plastic recycling.

[7] A plastic waste material contains the following plastics: PE, PP, PS, PVC. Suggest four methods to separate them.

[8] What are the environmental issues related with disposal of plastic waste? Explain.

[9] Suggest some of the important steps to reduce the use of plastics.

[10] Explain a suitable process to recover energy from plastic waste.

[11] Write short note on ***any two*** of the following:

(i) MRF

(ii) Circular economy

(iii) Facts about modern incinerators producing less carbon dioxide

Total Number of Pages 1
I^st SEMESTER
END SEMESTER EXAMINATION

Roll No.....
M .TECH (NST)
November 2019

NST-501 Physics of Nanomaterials

Time: 3:0 Hours *Max Marks: 40*

Note: Answer All questions.
Assume suitable missing data, if any

Q1. Attempt **any Two** of the following (5×2=10)

(a) Discuss quantum confinement effect and drive an expression for density of state in 0D, 1D, 2D and 3D.
(b) The lifetime of a nucleus is an excited state is 10^{-12} s. Calculate the probable uncertainty in the energy and frequency of a γ-ray photon emitted by it.
(c) Calculate the value of Fermi-energy at absolute zero temperature.

Q2. Attempt **Two** of the following (5×2=10)

(a) What is Bose-Einstein (B.E.) statistics? What are the basic postulated used? Derive an expression $n_i = {g_i}/{e^{(\alpha+\beta E_i)} - 1}$ for the most probable distribution of the particles of a system obeying B.E. statistics.
(b) What is phase space? Compare the basic postulates and results of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics.

Q3. Attempt **Two** of the following (5×2=10)

(a) Describe crystal structure, lattices, Bravais lattice and miller indices.
(b) Bragg found that in KCl crystal, strong reflections from the sets of planes (100), (110) and (111) are obtained for angles $5^0 23'$, $7^0,37'$ and $9^0,25'$. Show that KCl crystal has a simple cubic crystal structure.

Q4. Describe **any Two** of the following (5×2=10)

(a) Type I and Type II hetero structures
(b) Optical absorption and Emission processes
(c) Photoconductivity

Total No. of Pages 2 Roll No.....

I[st] SEMESTER M.Tech NST

END SEMESTER EXAMINATION NOV -2019

NST 503 - CHEMISTRY OF NANOMATERIALS

Time: 3:00 Hours *Max. Marks: 40*

Note : Answer all question by Selecting **any two parts** from each questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] Compare physio sorption and chemisorption with examples.

[b] Explain the fundamental of "Langmuir Adsorption Isotherm".

[c] Describe the adsorption behaviour of metal oxide nanoparticle.

(4,4,4)

Q.2[a] Differentiate covalent and electrovalent bonding.

[b] Write a note on π-π stacking.

[c]Discuss the effect of temperature and size on adsorption.

(4,4,4)

Q.3[a] Write the basic classification of colloids with examples.

[b] Describe the Helmholtz double layer charge stabilisation theory of colloids.

[c] Compare water to oil and oil to water emulsion.

(4,4,4)

Q.4[a]What is sol-gel? Explain its use in preparation of metal oxide nanoparticles

[b] Compare intercalated and exfoliated polymer nanocomposite.

[c]Write a note on use thermolysis in preparation of nano particles.

(4,4,4)

Q.5[a] Introduce ion exchange resins along with its application in water purification technology.

[b] Write a note on "Zeta Potential".

[c] Compare electrodialysis and reverse osmosis in context of water purification.

(4,4,4)

Total No. of Pages:2 *Roll No. ... .*

FIRST SEMESTER **M.Tech. [NST]**

END SEMESTER EXAMINATION ***(Nov./ Dec., 2019)***

NST-5305 **MATERIALS SCIENCE AT NANOSCALE**

Time: 3:00 Hours **Max. Marks: 100**

Note: Answer **ANY FIVE** questions

Assume suitable missing data, if any.

1(a). Obtain an expression for the equilibrium concentration of vacancies at a given temperature in metallic crystal. [10]

(b).Discuss any one model for the effect of grain boundary at mechanical properties on nano-materials using Hall-Petch relation. [5]

(c). Discuss about evaporation of water in a sealed nanotube as phase transition in small systems with proper conditions as well as suitable diagram. [5]

2(a). Classify different type of carbon nano-tubes (CNTs). Discuss the synthesis of CNTs with suitable diagram using Carbon Arc method. Write the application of CNTs in field emission. [10]

(b). Explain synthesis technique of zeolite nano-particles. Write down the applications of zeolite nano-particles. [10]

3(a). Explain dielectric properties of materials. Briefly discuss the piezoelectric and ferroelectric properties of bulk and nano-materials. [10]

(b). Describe the mechanical properties of carbon nano-tubes (CNTs). [5]

(c). Calculate ASTM grain size number n for a sample. If there are 52 full grains in the area, and 36 grains are cut by the circumference of the circle of area 1 inch^2. [5]

4(a). Discuss ferromagnetism in 3-D, 2-D, 1-D and 0-D nano-materials. Showing the variation of coercivity filed vs particle or grain size, explain the critical diameter and super-paramagnetic diameter for single and multi- domains. [10]

(b). What is thermal transport? Discuss thermal properties of nanomaterials in 0-D, 1-D, 2-D and 3-D. Establish relationship between upper melting temperature and surface tension of solid liquid interface for a spherical nanoparticle. [10]

5(a). Differentiate between anisotropic magneto-resistance (AMR) and giant magneto-resistance (GMR). Using the polarization of spins, explain the working mechanism of GMR with suitable energy density diagram. Write any two applications of GMR. [10]

(b). Discuss the electronic conduction properties of nano- materials in 3-D, 2-D, 1-D and 0-D. Draw the I-V characteristics for 3-D and 0-D. [10]

6. Explain Briefly any **FOUR**: [5 x4]

a. Optical Properties on nano-materials
b. Natural Nano-crystals
c. Dielectric Strength
d. C-60 crystal structure and its applications.
e. Nano-composites
f. Porous Silicon

Total No. of Pages: 2 *Roll No. .....*

FIRST SEMESTER **M.Tech. [NST]/PhD**

END SEMESTER EXAMINATION ***(Nov/Dec-2019)***

NST- 5401 COMPUTATIONAL PHYSICS AND PROGRAMMING

Time: 3 Hours *Max. Marks: 50*

Note: Attempt any five questions. Assume suitable missing data, if any.

1. **(a)** Use bisection method to find out a root of the equation $x^3-4x-9=0$ between 2 and 3. Apply five approximations. **[5]**

   (b) What is the basic difference between Regula Falsi and Secant method? Derive the formula for root calculation using Newton Raphson method. **[5]**

2. **(a)** Define all the difference operators. Express all of them in terms of shifting operator. **[5]**

   (b) Find the value of e^x when $x = 0.644$ using Everett's formula [5]

x	0.61	0.62	0.63	0.64	0.65	0.66	0.67
e^x	1.840431	1.858928	1.877610	1.896481	1.915541	1.934792	1.954237

3. **(a)** Derive Newton cote's formula for the integration. Deduce the Simpson one-third from the above general formula. **[5]**

   (b) Evaluate $\int_1^{1.2}\int_1^{1.4}\frac{1}{x+y}dxdy$ by using trapezoidal method. (Take $h=k=0.1$) **[5]**

4. (a) Given $\frac{d^2y}{dx^2} = y^3$, y(0)=10 and y'(0)=5. Find the value of y (0.1) by using fourth order RK method. [5]

(b) Using Euler's modified method, obtain a solution of equation $\frac{dy}{dx} = x + |\sqrt{y}|$ with the initial condition y (0) = 1, at x = 0.2 by taking increment of h = 0.2. [5]

5. (a) In a machine a slider moves along a fixed straight rod. Its distance 'x' cm along the rod is given below for various value of time 't' sec. Find the velocity and acceleration of the slides when t = 0.6 sec [5]

$t(sec)$	0.0	0.1	0.2	0.3	0.4	0.5	0.6
$x(cm)$	30.13	31.62	32.87	33.64	33.95	33.81	33.24

(b) Derive the expression for first order derivative using any one method of your choice, if the given data's are non-equispaced. [5]

6. (a) An object is standing on a plane whose slope varies with constant velocity ω. After t seconds its position is $s(\omega,t) = \frac{g}{2\omega^2}[\sinh(\omega t) - \sin(\omega t)]$ where g = 9.8 m/s^2 denotes the gravity acceleration. Write a function script in Matlab which takes in the values s and t and returns the value of ω calculated using the *bisection method* with a tolerance of 10^{-5}. $[\omega_1 \le \omega \le \omega_2]$ [5]

(b) The equation of motion of a rocket-propelled sled is, from Newton's law:

$$m\dot{v} = f - cv$$

where m is the sled mass, f is the rocket thrust, and c is an air resistance coefficient. Suppose that m = 1000 kg and c = 500 N.s/m. Suppose also that v(0)=0 and f = 75,000 N for $t \ge 0$. Write a Matlab program to determine the speed of the sled at t =5 and 10 s. [5]

Total No. of Pages 1

Roll No. .....

THIRD SEMESTER

M.Tech. (HST)

END SEMESTER EXAMINATION

(Nov.-2019)

AP- 7011 Nanoelectro-mechanical materials

Time: 3 Hour

Max. Marks: 100

Note: Attempt all the questions.
All questions have equal marks

1. What is negative refraction? Write the mathematical expression for negative refractive index and explain it with the help of co-ordinate axes.

2. Describe the Photonic Crystal Fibers (PCFs) and its different method for propagation?

3. Name the different synthesis technique for CNTs and also describe them in brief.

4. (a) Explain the different applications of Metamaterials.
   (b) How PCFs is useful in single mode operation for a wide range o wavelength?

5. What to understand by functionalization and purification of CNTs Describe different processes for functionalization CNTs.

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Total No. of Pages: 2 *Roll No...*

THIRD SEMESTER M.Tech. NST

END SEMESTER EXAMINATION November-2019

AP-7021: NANO BIOTECHNOLOGY

Time: 3 Hours *Max. Marks: 100*

Note: Answer ALL questions.
Assume suitable missing data, if any

Q1. Attempt all **Three** of the following (3×10=30)

[a] Briefly discuss the chemical compositions of plants which play an essential role in the development of the different types of nanoparticles and the process involved.

[b] Write down the name of five plants and five microorganisms used as a precursor in the synthesis of nanoparticles.

[c] Write an overview (review) of the synthesis of AgNPs and AuNPs using biogenic methods.

Q2. Attempt **any Two** of the following (2×10=20)

[a] Explain magnetic and non-magnetic oxide nanoparticles with examples.

[b] Briefly explain the applications of nanoparticles .

[c] Explain the toxicity effect of metal oxide based nanoparticles to the environment using microorganisms.

Q3. Attempt **any Two** of the following (2×10=20)

[a] Explain the type of soft biomaterials used for tooth regeneration and also draw a well labelled diagram of the human tooth.

[b] Define natural nanocomposite spider silk and Draw a diagram of spider silk protein processing to fibers and films.

[c] Give a schematic representation of natural and synthetic bone substitution materials. Also, explain the role of porosity and shape of the material in bone regeneration.

Q4. Attempt any Three of the following (3×10=30)

[a] Explain nanoparticles-biomaterial hybride system for bioelectronic devices.

[b] Briefly explain Nanobiosystems.

[c] Explain biochips with their application and diagram.

[d] Briefly explain different types of Biosensors with their applications.

Total No. of Pages 02 Roll No.....

I SEMESTER M.Tech. (BIOINFORMATICS)

END SEMESTER EXAMINATION Nov/Dec-2019

BIO 501 INTRODUCTION TO BIOINFORMATICS

Time: 3:00 Hours Max. Marks : 40

Note : Answer all questions by selecting any two parts from each question.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] Differentiate between Primary, Secondary and Composite Databases with examples.

[b] What is the role of a bioinformatician in present biological research and development area?

[c] Define redundancy in a database. Why is redundancy an issue? How can it be solved?

Q.2[a] Align the following sequences using Needleman-Wunsch algorithm:
GAATTC and GATC
using identity score of +2, similarity score of +1, mismatch score of -1 and gap penalty of 0.

[b] Explain the algorithm behind BLAST.

[c] Differentiate between PAM and BLOSUM substitution matrices.

Q.3[a] What are the functional consequences of various type of SNPs?

[b] Write some key findings of Human Genome Project.

[c] Write the methods to identify RFLPs and discuss their aplications.

Q.4[a] Differentiate between dynamic, progressive and iterative methods of multiple sequence alignment.

[b] What is a consensus sequence? Show representation of a consensus motif in DNA.

[c] Give a work flow chart for building a typical phylogenetic tree.

Q.5[a] Discuss the components of Gene ontology.

[b] Why data normalization and calculation of fold change is done in microarray data analysis?

[c] What is hypergeometric test and where is it used?

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Total No. of Pages 01 Roll No. .....

FIRST SEMESTER **M.Tech. (BIOINFORMATICS)**

END SEMESTER EXAMINATION ***Nov-2019***

BIO 503 ADVANCED PROTEOMICS

Time: 3:00 Hours ***Max. Marks: 40***

Note: Answer five questions only (***Question 1-3 are compulsory***)
Each question carries 08 marks.
Assume suitable missing data, if any.

Q.1. Lactate dehydrogenase (LDH) enzyme has organ specific isoforms. How would we get all the specific isoforms in the native stage as well as their exact molecular masses *in situ*? Explain the method of protein cross linking and its relevance.

Q.2. Describe the microarray analysis and what are the importance of different commercially available microarray techniques. Explain at least two microarray techniques along with the importance of heat map and Z-score value.

Q.3. What do you mean by a truncated epitope? What is the relevance of peptide mapping in the generation of such antibodies in proteomics? How would you go for the bulk production of recombinant proteins?

Q.4 Hypoxia responsible element (HRE) is an important cis-acting regulatory binding element that is present in Akt gene and controls the regulation and expression via trans-activation mechanism. Using Bioinformatics tool it has been observed that several such elements are present in between -3000bp to -1200bp that are responsible to maintain the angiogenesis process. Further, HRE transcription factor binding elements are repeatedly present in between -400bp to -900bp along with GATA-1 TFBEs. Describe the possible technique (s) that would prove and validate the presence these two transcription factor binding elements in 5' flanking region.

Q.5. Describe "omics theory" from the evolution point of view. How the genetic flow of life in early 50s?. Also describe the alterations in the genetic flow from 1950 until the deciphers of "Omics" approach.

Q.6. What do you mean by *in situ* gel staining? Why do we need signal quantification and image analysis in genomics and proteomics? What is the usage of internal control of a protein for the exact expression fold?

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Total No. of Pages:3 *Roll No.....*

FIRST SEMESTER M. Tech. (BIOTECH)

END SEMESTER EXAMINATION November-*2019*

BIO5301 DATA WAREHOUSE AND DATA MINING

Time: 3:00 Hours *Max. Marks: 50*

Note: All questions are compulsory. Assume suitable missing data, if any.

SECTION A

Q1 Attempt any five questions:

a) Give the reason why clustering is needed in data mining.
b) What are the different steps in data transformation?
c) What are eager learners and lazy learners?
d) What is the use of meta data in the data warehouse?
e) How can Data Mining help business analyst?
f) List out the differences between OLTP and OLAP.

[2X5]

SECTION B

Attempt any *FIVE*:

Q2 a) Compare and contrast K-means and DBSCAN.
b) State K-means algorithm. Apply the k-means algorithm with two iterations to form two clusters by taking the centers of the initial clusters as subjects 1 and 4

Subject	A	B
1	1.0	1.0
2	1.5	2.0

3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

[3+5]

Q3 a) Briefly compare data cleaning, data transformation and refresh with suitable example.

b) What are the principles of the APRIORI algorithm? Illustrate working of A-priori algorithm for the following dataset?

Transaction ID	Items
T001	Milk, dal, sugar, bread
T002	Dal, sugar, wheat, jam
T003	Milk, bread, curd, paneer
T004	Wheat, paneer, dal, sugar
T005	Milk, paneer, bread
T006	Wheat, dal, paneer, bread

Can we design a method that mines the complete set of frequent item sets without candidate generation? If yes, explain with example table mentioned above. [3+5]

Q4 a) Classification is supervised learning. Justify.

b) Describe the essential features of decision trees in the context of classification. What are the advantages and disadvantages of decision trees over other classification methods? [3+5]

Q5 a) What do you mean by slice and dice? Give an example.

b) How does a snowflake schema differ from a star schema? Name two advantages and two disadvantages of the snowflake schema.

[3+5]

Q6. a) What is Clustering? What are the different types of clustering?

b) Explain the differences between classification and clustering briefly and give an informal example of an application that would benefit from each technique. [3+5]

Q7 a) Explain FP Growth algorithm.

b) Explain the Naïve Bayes algorithm. Show how it is used in classification. [3+5]

Q8 a) Describe the steps involved in Knowledge Discovery in Database (KDD) process.

b) With the help of neat sketch explain the architecture of Data Warehouse. [3+5]

Total No pages: 02 Roll No. .....

SEMESTER – I M.Tech (Biotechnology)

FINAL SEMESTER EXAMINATION NOVEMBER 2019

BIO 5407: Omics in medicine

Time: 3 hrs *Maximum Marks: 50*

Note: Answer any five of the following questions. Answer should be brief and to the point

1. What are different classes of non coding RNAs? Write in brief the role of non-coding RNAs in disease regulation with few examples. **2+3=5**

2. What do you understand by epigenetics? Write in brief about the role of epigenetics mechanism in regulation of human diseases (clinical epigenetics) with few examples? **1+4=5**

3. What is clinical metagenomics? How clinical metagenomics helps in disease diagnosis and prevention? **1+4=5**

4. What do you understand by genomic medicine? How genomic medicine is helpful in todays` human society? List few priorities in implementing genomic medicine. **1+2+2=5**

5. Write in brief about the role of exome and genome sequencing in genomic medicine. **5**

6. What do you understand by rare diseases? Mention few examples of rare diseases in which genomic medicine have been successfully used for diagnosis and treatment. **5**

7. Describe briefly the progress of application of genomic medicine in Public health in India. **5**

8. What is translational genomics? How translational genomics is helpful in development of precision and/or personalized medicine? Give few examples. **1+4=5**

9. Write in brief about the development, application and success of pharmacogenomics with examples. **5**

10. Write in brief about the Genomic risk prediction of complex human diseases and its clinical applications. **5**

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Total No. of pages 2 Roll No.....

III SEMESTER M.TECH. (Bioinformatics)

END SEMESTER EXAMINATION (Nov 2019)

BT-7011 Immunoinformatics

Max.Marks: 100 Time: 3 Hours

Note: Part A is compulsory. (40 marks)
Part B: Attempt any 6 questions (60 marks)
Assume suitable missing data, if any.

PART A (Compulsory section)

1. Write short notes on the following : (3x5=15 marks)
   a. Computational vaccinology
   b. SVM
   c. T and B cell epitope prediction

2. Discuss how we can classify HLA haplotypes into 9 different supertypes. What is the practical use of classification in supertypes? (15 marks)

3. Explain how diversity in antigen binding site of antibody generated? How does classical complement fixation differ from alternative pathway in its initiation? (10 marks)

PART B

(Attempt any 6 questions, each carries equal marks)

4. Describe how Tap deficient mice will suffer from defects in MHC presentation. What is cross presentation of antigens by MHC?

5. Describe immunity to tumors. Describe how epitope prediction tool can be useful to prevent killing of normal cells by immune cells.

6. Differentiate between Traditional and New age Polio vaccines giving the advantages of the new age vaccine over the traditional Polio drops.

7. Describe the possible causes and therapy of autoimmune disorders. Explain how pernicious anaemia and haemolytic anaemia differ at the level of molecular targeting.

8. What is graft vs host rejection? Differentiate between Type II and Type IV hypersensitivity.

9. Alternative pathway for complement fixation involves an amplification step, explain. Describe using an example how mathematical disease modelling can help in therapeutics.

10. Give a comparative account of B and T cell signalling. Explain the role of CTLA 4 and CD28 in T cell activity regulation.

END

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Total No. of pages. 2

Roll No.....

THIRD SEMESTER M.TECH. (BIOINFORMATICS)

END SEMESTER EXAMINATION (NOVEMBER-2019)

BT-7023 NANOTECHNOLOGY IN HEALTHCARE

Time: 3.00 Hours **Max.Marks: 100**

Note: **Answer all Questions.**
Assume suitable missing data, if any.

PART A

Q 1. All questions are Compulsory, answer briefly (3 x 10)

a. Write down the two biomaterials used for preparation of muscles, neurons and cardiovascular system.
b. Briefly explain the immunology of transplant rejection.
c. Give details on principle and lookout methods for cantilever sensing.
d. Briefly describe tethered lipid membranes and its applications.
e. What are anti-proliferative agents, explain with examples?
f. How tissue engineering is being implemented in diabetes treatment, explain.
g. What are molecular beacons explain?
h. What are nano level vaccines and what are its advantages.
i. What are immunosuppressive agents explain with examples?
j. What is PCR, how it can be used in genetic fingerprinting.

PART B

Q 2. Write short notes on Any two of the following, briefly describe their applications. (5 x 2)

a. Bio-barcode assay
b. Artificial retinal prosthesis
c. Cardiac pacemaker and implantable cardioverter defibrillator (ICD)

P.T.O

PART C

Q 3. Attempt Any four of the following questions. **(15 x 4)**

A. Define biomaterials and along with its classification briefly describe the significance of cell-surface interactions in the area of regenerative medicine, briefly explain the *in-vitro* and *in-vivo* methods applied for biocompatibility testing.

B. What is tissue engineering and how tissue engineering methods are currently being implemented in regenerative medicines, discuss about strategies applied development of artificial arteries?

C. Describe briefly in your words

a. Describe the process of bone remodeling and repair, briefly discuss about strategies applied in bone tissue engineering.

b. Define Nanobiosensor and its components. Explain principle and types of nanosensors along with its application.

OR

à. Describe the process of wound healing and repair, briefly discuss about strategies applied in skin tissue engineering?

b. What are neuroprosthetic, briefly discuss about the methods applied for nerve regeneration.

D. Answer **all** the following question

a. Briefly discuss the role of nanomaterial in clinical diagnostics and treatment of cancer, what are its advantages and significance in current scenario?

b. Define Immunogen. Explain various types of immunoassay techniques.

E. Answer **any one** of the following question

a. Define the term Medical Imaging. Elaborate the different types of imaging techniques along with their advantages.

OR

b. What are drug delivery systems? How are nano drug delivery systems used in current medical practice, briefly discuss about the new technologies being developed by researchers for nano drug delivery?

-END-

Total No. of Pages 01

Roll No. .....

FIRST SEMESTER

M.Tech. [Bio Medical Engineering]

END SEMESTER EXAMINATION *Nov-2019*

BME 501 Human Anatomy and Physiology

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer five questions only (***Question 1- 3 are compulsory***)
Each question carries 08 marks.
Assume suitable missing data, if any.

Q.1. Differentiate between facial and cranial bones. What are the different types of nerve in the human body? Based on the anatomical positions, how would you explain the human body? Explain the extremities.

Q.2. Severe change in albumin vs globulin ratio is an indicative measure of organ failure. Explain what are the different tests have to be performed to justify particular organ damage.

Q.3. Explain the blood circulation in human heart and lungs. Explain the heart pace maker and what are the agonist and antagonist that modulate the heart rate. Describe the phenomenon of polarization, depolarization, hyperpolarization and repolarization.

Q.4. What do you mean by muscular fatigue and *Rigour mortis*? How anaerobic and aerobic respirations regulate muscle physiology? Explain the production of lactic acid in our body during excessive muscle movement.

Q.5. What is the process of RBC production and maturation? Why serine protease and Ca^{+} are important components in blood clotting? Describe the intrinsic and extrinsic pathways in blood clotting.

Q.6. Describe the method for the metabolism of macromolecules along with the degradation components and enzymes. Explain the reflex arch and feedback loop.

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Total No. of Pages:

Roll No.....

FIRST SEMESTER

M. Tech (BME)

END SEMESTER EXAMINATION

Nov 2019

BME-503 BIOMATERIAL AND CLINICAL DEVICES

Time: 3.00 Hours

Max. Marks: 40

Note: Answer ALL questions. All questions carry equal Marks

Assume suitable missing data, if any.

1. Answer all the following questions:
[a] What is the composition of implant Type 316L? [1.5]
[b] What is the pH of blood and urine of a healthy person? [1.5]
[c] Define passivation. [1.5]
[d] Name two indicator enzymes for phagocytosis. [1.5]
[e] Full form of PETA [2]

2. Attempt any TWO questions out of the following:
[a] What are the characteristics of thrombo-resistant implant? [4]
[b] Schematically draw classical complement pathway. [4]
[c] Differentiate: (i) carcinoma and sarcoma, (ii) neutrophils and basophils [4]

3. Attempt any TWO questions out of the following:
[a] Write a short note on medical applications of polymers. [4]
[b] Write a short note on glass ceramics. [4]
[c] Write a short note on drug delivery system. [4]

4. Attempt any TWO questions out of the following:
[a] What are the identified factors responsible for an implant to be carcinogenic? [4]
[b] An implant XY (partially metallic and partially polymeric) has been prepared, What parameters (physical, chemical and biological) should be tested before it can be used for humans? [4]
[c] Following materials (A, B, C, D, E) are being used in synthesizing different types of implants to be used at different sites inside rabbit.

Materials	Size (μm)	Oxygen Consumption by Alevolar Macrophages (mol $cell^{-1}$ s^{-1})
A	2.5	3.8×10^{-5}
B	1.8	4.7×10^{-5}
C	2.2	5.8×10^{-5}
D	3.3	2.1×10^{-5}
E	3.1	1.8×10^{-5}

Arrange the above materials in order of their decreasing phagocytic efficiency and justify. [4]

5.Attempt any TWO questions out of the following:

[a] How can we test carcinogenicity of newly developed implant under *in vitro* Conditions ? [4]

[b] Following metals are being used for the fabrication of implants. These metallic implants are tested in rodents by estimating their metallic ions concentrations in the urineafter 24h.

Metal	Plasma Conc. (µg/l)	Urine Conc. (µg/l)	Permeability Ratio (K_s)	Excretion Ratio (E_s)
Al	2.7	7.8	0.29	0.11
Co	1.2	0.76	0.64	0.26
Ti	3.2	0.43	0.14	0.09
Ni	1.8	2.5	1.39	0.51

Please arrange above metals in order of their increasing toxicity and justify. [4]

[c] Describe any two tests(static or dynamic) for identifying hemolytic property of newly synthesized implant under *in vitro* conditions. [4]

Total no. of pages. 3

Roll No.....

FIRST SEMESTER

M.TECH (BME)

END SEMESTER EXAMINATION **(Nov./Dec-2019)**

BME-5301 NANOBIOTECHNOLOGY & NANOMEDICINE

Time: 3.00 Hours **Max.Marks: 50**

Note: **Answer <u>All Questions</u>.**
Assume suitable missing data, if any.

PART A

Q 1. All questions are <u>Compulsory</u>, answer briefly **(2 x 10)**

a. Define LD_{50} and LC_{50}, briefly explain dose response curve.

b. Describe ROS induced lipid peroxidation inside cell.

c. Briefly explain about electrical and medical properties of carbon nanotubes.

d. To design nano-drug for fast drug response, improved resident time with low toxicity, what kind of nanomaterials and formulations are used, explain why?

e. The LD50 for 20 nm Silver nanoparticles is estimated to be about 354 mg/kg.

I. Worldwide, the average weight of an adult is 137 lb. What is this weight in kg,

II. Calculate the lethal dose of 20 nm Silver nanoparticles for an average adult, in mg.

f. Name the nanomaterial for (a) Live tracking potential (b) Non-immunogenic (c) Transfection of gene (d) Amphipathic drug delivery

g. Briefly describe the following principles and the applications in MEMS devices.

I. Lorentz force

II. Coriolis force

III. Electrostatic forces

1-478-1

h. What is eutectic bonding? Describe the mechanism involved.
i. List 2 advantages and 2 disadvantages of positive vs. negative PR. What are the common applications of each?
j. What is Pharmacokinetics and Pharmacodynamics?

PART B

Q 2. Attempt <u>any five</u> of the following questions **(3 X 5)**

a. Fabricate a cantilever using bulk micromachining and surface micromachining technique, how does cantilever sensing is applied in medical and diagnostics.
b. Describe the working of Argus™ Retinal Prosthesis System.
c. Describe the cardiac electrophysiology and functioning of MEMS based Pacemaker.
d. Describe the design and validation steps involved in microfluidic devices.
e. Schematically illustrate the steps involved in fabrication of bulk micromachined pressure sensor, what are its applications in medical and automobile sector.
f. Write down the different synthesis methods applied for the preparation of solid lipid nanoparticles and their applications.
g. Describe the structure and working principle of MEMS micro-accelerometers.
h. What are intelligent structures, how does it differ from a smart structure, briefly describe the properties of SMPs and its applications.

PART C

Q 3. Attempt <u>all</u> of the following questions **(5 X 3)**

A. Answer <u>any one</u>

a. What are drug delivery systems? How MEMS based drug delivery systems used in current medical practice, briefly discuss about the new technologies being developed by researchers for MEMS based drug delivery?

b. What is micropump? Discuss about the non-mechanical micropumps along with its mechanism and applications.

B. Answer **<u>any one</u>**

a. Describe how Nanotechnology is changing the future of Medicine, emphasize particularly in pharmaceuticals and diagnostics; give an overview of its benefits and applications.
b. Discuss the Ion implant method for doping in semiconductors. What are the different stopping methods implemented to control the doping?
c. Discuss about the properties and applications of PDMS, with schematic illustration describe the methods for fabricating a two inlet microfluidic device using photolithography and soft lithography. Comment on lab-on-a-chip: next-generation companion diagnostics for personalized medicine.

C. Answer **<u>any one</u>**

a. What is nanotoxicology? How does nonmaterial affect the vital organs of the body, how to estimate the potential hazard related to nanoparticles?
b. Describe the important techniques for nanofabrication; along with suitable figures discuss its applications.

-END-

Total No. of Pages:02 *Roll No. ... .*

M.Tech[BIOMEDICAL ENGINEERING] ***First Semester***

END SEMESTER EXAMINATION ***(November-2019)***

BME 5401 MEDICAL PHYSICS AND BIOCHEMISTRY

Time: 03Hours ***Max. Marks: 40***

Note: Answer all questions.
Assume suitable missing data, if any.

1. Give ***brief*** explanation of ***all*** of the following **[1x8]**

(i) Why is it so that, most unsaturated fatty acid found in phospholipid are in *cis* rather than *trans* conformation?

(ii) The composition (in molar fraction unit) of one strand of DNA helix is [A] = 0.28 and [G] = 0.26, what can you say about [T] and [C]?

(iii) The mean velocity in an artery of internal diameter 15 mm is 0.9 m/s. It may be assumed that blood has a viscosity of 0.014 Pa and a density of 900 Kg/m^3.Calculate Reynolds number to deduce whether the flow is laminar or turbulent.

(iv) Vitamin C deficiency leads to scurvy disease in which elasticity of the skin is reduced very much, why?

(v) Why does thymine base is found in DNA rather than uracil?

(vi) What is the signification of methylating nucleotide base?

(vii) How Riva-Roki method of traditional B.P. measurement can be automatized?

(viii) What is the difference between annealing and hybridization of DNA?

2. Attempt any ***four*** of following **[4x4]**

A. Which are more susceptible cells for radiation hazards? What precautions one should take to avoid such radiation while working in lab?

B. Write mode of circulation of lymphatic system in body.

C. What is airway resistance? Write down application of Hogen-Poiseuille equation.

D. Explain effect of GC content on Tm (melting temperature) of DNA and explain the phenomenon of hypochromacity.

P.T.O.

E. Describe different ways of identification and analysis of fats and oils.
F. Explain the role of Bernoulli's principle in blood flow

3. Attempt any *two* of following [8x2]

a) Explain Hodkin-Huxley model for action potential in axon and mechanism of action potential in neuron and electric charge conduction
b) Describe different secondary and super-secondary structure of proteins with examples, also write down various forces that stabilizes protein structure.
c) Explain various structural component/organization of muscle fibre. Discuss the mechanism of muscle movement in detail.

-END-

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Total No. of pages 2 Roll No.....

III SEMESTER M.TECH. (Biomedical Engineering)

END SEMESTER EXAMINATION (Nov 2019)

BT-7111 Bioethics and IPR

Max.Marks: 100 Time: 3 Hours

Note: Part A is compulsory. (40 marks)
Part B: Attempt any 6 questions
Assume suitable missing data, if any.

Part A (Compulsory)

1. What is the difference between patent, copyright and trademark? How is software design protected in India?
2. Describe the procedure for grant of patents in India. What are the conditions in which a patent already granted may be revoked?
3. Describe the purpose of the different phases of clinical trials. In what circumstances is a systemically acting drug used on humans does not require undergoing clinical trials?
4. Write short notes on :
   a. Placebo
   b. ELSI related to post human genome drug discovery
   c. Plant breeder rights
   d. Biosafety containment facilities

Part B (Answer any 6 questions)

5. What is plagiarism? If a researcher quotes the research findings of another researcher verbatim but cites the name of the original author, does it constitute as plagiarism? In another case, a researcher has described the research findings of another researcher in his own words but has not mentioned the name of the original researcher either in inline text or in bibliography, does this qualify as plagiarism?

P.T.O.

6. Using case studies describe how medicinal plant products used in Indian traditional knowledge can be protected from being patented by modern researchers.
7. Discuss organizational management in the context of biomedical industry. Comment on individual ethics vs social ethics differing in the context of euthanasia and long term palliative care.
8. What are incidence and prevalence of a disease? When incidence of a disease is higher than prevalence of the disease, what does it signify? If a prophylactic vaccine is working effectively in a population how will it influence incidence and prevalence of the disease?
9. What is the significance of a trademark? Explain using suitable example. Is a trademark and patent restricted by geographical limitation? If a trademark of a ice-cream factory is not in use for 10years but the design in the trademark is being used now by a book shop, is it duplication of trademark and copyright violation?
10. Giving a true case study explain how bioethics regarding GMO has been debated. Discuss the issue of biodiversity protection in light of development of newer genetically modified gene pool as well as probable challenges in case all genetic diversity is skewed by human intervention. How is this situation different from traditional plant breeding?
11. What is triple packaging? Describe how the following materials need to be transported as per WHO regulations:
    a. Radioactive Chromium
    b. Vial containing culture of infectious bacteria

END

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Total No. of Pages 02 Roll No.....

III SEMESTER **M.Tech. [Biomedical Engineering]**

END SEMESTER EXAMINATION ***Nov/Dec-2019***

BT-7122 BIOINFORMATICS

Time: 3:00 Hours *Max. Marks : 100*

Note : Answer all questions by selecting any two parts from each question.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] State and explain various data retrieval tools in bioinformatics.

[b] Explain central dogma of molecular biology with neat diagram. Discuss its relevant in information science.

[c] What are the various types of biological data stored in online databases? Give examples.

Q.2[a] Compute the global alignment between the two sequences S1 = ABCNJRQCLCRPM and S2 = AJCJNRCKCRBP using match score of +2, mismatch score of -1 and gap penalty of 0.

[b] What is hamming distance? Find the hamming distance between S1 = ABCNJRQCLCRPM and S2 = AJCJNRCKCRBP.

[c] What are the advantages of dot plot over dynamic programming approach for pairwise sequence alignment?

Q.3[a] What are the various bioinformatics methods that can be used to characterize a novel protein sequence?

[b] State the applications of multiple sequence alignment in bioinformatics analysis.

[c] What is the difference between distance and character based phylogenetic tree building approach?

Q.4[a] Explain, with examples, the difference between homologs, orthologs, paralogs and analogs.

[b] Discuss various types of phylogenetic tree representations.

[c] What are the advantages and disadvantages of various multiple sequence alignment algorithms?

Q.5[a] What is BLAST? Describe the types and uses of BLAST.

[b]What are the differences between protein primary, secondary and tertiary structures? Also discuss the DSSP classification of protein secondary structure.

[c] Discuss the comparative genomics approaches for gene prediction.

—55(EL)

I Semester

M. Tech (IBT)/ Ph.D

End-Semester Examination November 2019

Paper Code: IBT-501
Time: 3 h

Sub: Bio-energy
Max. Marks= 40

Note: Answer all questions by selecting any two parts from each question. (10 marks for each question)
All questions carry equal marks
Assume suitable missing data, if any

Q1. (a) Schematically represent the bi-hydrogen production by anaerobic bacteria.

(b) Explain various factors affecting the bi-hydrogen production.

(c) Describe the future aspects of biodiesel production from plants.

Q2. (a) Illustrate unit operations in alcohol production and distillation.

(b) What are the criteria for the selection of micro-organisms and raw materials for bio-ethanol production?

(c) Bio-ethanol production from sugarcane industry will improve the Indian economy. Comments on it.

Q3. (a) Discuss about the recent development in electric vehicles and its future in India.

(b) How lipids can be used as a source for bio-diesel production?

(c) Discuss about the national policies of bio-fuel production in India.

Q4. (a) Briefly explain the recent trends in bio-energy research in India.

(b) Production of bio-fuel raw material from the waste water is a global attractive area of research. Comments on it.

(c) What are the challenges and future prospects of Nuclear power in India?

Total No. of Pages: 01

Roll No. ... .

M. Tech. (IBT)

First Semester

End Semester Examination

(Nov.-2019)

IBT 503

Industrial Plant Biotechnology

Time: 3 hours

Max. Marks: 40

Note: Attempt all questions. Each question is of 5 marks

1a) Explain cellular totipotency. What role does it play in plant regeneration? (2.5)

b) Discuss the status of plant tissue culture industry in India (2.5)

2) Describe different types of bioreactors used for secondary metabolite production using plant cell culture technology. (5)

OR

What are secondary metabolites? How are they produced in culture? Name some important metabolites produced using this method.

3) Describe the role of enzymes in protoplast fusion and development of somatic hybrid. Give the applications of somatic hybrids. (5)

4) Explain the significance of cryoprotectants and pretreatment during the process of cryopreservation? Give an outline of Cryopreservation of plant cultures (5)

5) *Agrobacterium* is a natural genetic engineer. Explain. Discuss Strategies adopted for pTi-based vector construction (5)

6) What are reporter genes and selectable marker genes? Explain the role of CAT and GUS gene in selection of transformed cells.

OR

Discuss different vectorless methods of plant transformation. (5)

7) What are transgenic crop plants? Citing examples describe how the transgenic can be used as biofactories for the production of carbohydrates, vitamins and edible vaccines. (5)

8) What is δ-endotoxin? Give diagrammatic representation of its mode of action on insects. Give a schematic representation of insect resistant transgenic development.

OR

Explain the role of plant bioinformatics in crop improvement (5)

Total No. of Pages 1

Roll No.....

FIRST SEMESTER B.Tech./M.Tech./MBA/Ph.D/ B.Tech. (Evel)

END SEMESTER EXAMINATION *Nov/Dec-2019*

PAPER CODE: IBT-5303

TITLE OF PAPER: Food Engineering and Technology

Time: 3:00 Hours *Max. Marks : 50*

Note : Answer all question by Selecting any two parts from each questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] What is bioavailability of nutrients? Give examples for some of the nutrients whose bioavailability is variable. Also, detail factors affecting their availability.

[b] What is catabolite repression? Why is it important with respect to fermentation process? Mention two mutations for overcoming catabolite repression.

[c] Define microbial growth. Give detailed description of the factors that regulate microbial growth in food items, with a special note on water activity.

Q.2[a] Explain food poisoning. Write a detail note on *E. coli* or Staphylococcus as agents of food poisoning.

[b] Differentiate between homolactic fermentation and heterolactic fermentation with one detail example for each.

[c] What are the different ways in which we can initiate a fermentation process with respect to starter culture? Define characteristics of LAB.

Q.3[a] What is salmonellosis? Detail Salmonella with respect to food.

[b] What is Botulism? Describe botulinum structure and mechanism of action to have ill effects on human health.

[c] Write a detail note on food process operations, "Evaporation".

Q.4[a] Write a note on distillation as a food processing method.

[b] What is HACCP? Write a short note on it.

[c] Write detail note on commercial buttermilk production.

Q.5[a] What is synergistic growth? Give examples of it in dairy product fermentation.

[b] Explain heat treatment with respect to food sterilization and packaging.

[c] Write a short note wine fermentation process.

Total No. of Pages: 02

Roll No -59-

FIRST SEMESTER **M.Tech. (Industrial Biotechnology)**

END SEMESTER EXAMINATION **November-2019**

IBT-5401 BIOINSTRUMENTATION

Time: 3:00 Hours **Max. Marks: 40**

Note:
1. Attempt all the questions. However, all questions are compulsory but you may find internal choice in the questions.
2. Marks are indicated against each question
3. Do not write or tick (√) anything on question paper other than your roll number.
4. Use of log/ antilog tables & scientific calculator is allowed.

Q.1: Attempt ALL of the following questions:

a) Calculate the conductivity cell constant of a dual probe of conductivity and TDS which measures the TDS of 49mg/L and specific conductivity of 140µS/cm for a sample. **03 Marks**

b) A particle moves half way down in a centrifuge cell in 10 minutes at a speed of 10,000 rpm, how long it would take to reach the same position if the speed is increased to 20,000 rpm? **03 Marks**

c) List the two detectors each, used for GC and HPLC **02 Marks**

d) List various methods of ionization and briefly discuss any two methods of ionization in mass spectroscopy. **02 Marks**

e) Define resolving power of a microscope and also, write the mathematical expression to calculate the resolving power of a compound microscope. **02 Marks**

f) What is electrophoresis? Explain why it is called incomplete electrolysis? **02 Marks**

Q.2: Attempt any TWO questions out of the following: **2x04 Marks**

a) Normal pH of blood is 7.40 and it is maintained by the buffering action of HCO_3^- & CO_2 resulting from gaseous CO_2 dissolve in blood while maintaining a maximal level of HCO_3^- as 25.80mM. A patient is suffering from obstructive lung disease leading to hypoventilation. Blood biochemistry examination revealed that the blood pH of this patient is 7.15 and CO_2 concentration is 1.15mM. What is the serum HCO_3^- concentration of this patient and what are its possible implications on patient health? (Given: pKeq= 6.10).

b) A particle with sedimentation coefficient(s) of $1x10^{-13}$seconds is centrifuged at an average radius of 10cm at 6000rpm. Calculate its velocity of sedimentation(V) and fractional force(F) acting on it if the fractional coefficient(f) is 0.5.

c) Draw the titration curve for amino acids (i) D and (ii) E

Q.3: Attempt any TWO questions out of the following: 2x04 Marks

a) What is affinity tag purification and where it is used, explain in detail?

b) What are ampholytes and explain their role in bioanalytical techniques and bioinstrumentation.

c) What are "peak shoulders and plateau"? Explain at least two possible measures to resolve each of them.

Q.4: Attempt any TWO questions out of the following: 2x2.5 Marks

a) What are radiative and non- radiative transitions?

b) What is quadruple? Explain its use and significance in spectroscopy.

c) What is microtome? Explain it significance and use in bioinstrumentation.

d) Write a short note on "effects of localized heating" in gel electrophoresis

Q.5: Attempt any TWO questions out of the following: 2x2.5 Marks

a) What is cantilever? Explain constant height and constant force modules of cantilever operations in microscopy.

b) Describe the various methods of sample loading in capillary electrophoresis.

c) What are fluorophores and explain their application in bioinstrumentation.

d) What are molecular vibrations? Explain various types of molecular vibrations and their application in bioinstrumentation.

COMMON LOGARITHMS $\log_{10} x$

x	0	1	2	3	4	5	6	7	8	9	Δ_m	1	2	3	4	5	6	7	8	9
											+	ADD								
10	·0000	0043	0086	0128	0170	0212					42	4	8	13	17	21	25	29	34	38
						0212	0253	0294	0334	0374	40	4	8	12	16	20	24	28	32	36
11	·0414	0453	0492	0531	0569	0607					39	4	8	12	16	19	23	27	31	35
						0607	0645	0682	0719	0755	37	4	7	11	15	19	22	26	30	33
12	·0792	0828	0864	0899	0934	0969					35	4	7	11	14	18	21	25	28	32
						0969	1004	1038	1072	1106	34	3	7	10	14	17	20	24	27	31
13	·1139	1173	1206	1239	1271	1303					33	3	7	10	13	16	20	23	26	30
						1303	1335	1367	1399	1430	32	3	6	10	13	16	19	22	26	29
14	·1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	30	3	6	9	12	15	18	21	24	27
15	·1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	28	3	6	8	11	14	17	20	22	25
16	·2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	26	3	5	8	10	13	16	18	21	23
17	·2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	25	2	5	7	10	12	15	17	20	22
18	·2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	24	2	5	7	10	12	14	17	19	22
19	·2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	22	2	4	7	9	11	13	15	18	20
20	·3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	21	2	4	6	8	11	13	15	17	19
21	·3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	20	2	4	6	8	10	12	14	16	18
22	·3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	19	2	4	6	8	10	11	13	15	17
23	·3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	18	2	4	5	7	9	11	13	14	16
24	·3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	18	2	4	5	7	9	11	13	14	16
25	·3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	17	2	3	5	7	9	10	12	14	15
26	·4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	16	2	3	5	6	8	10	11	13	14
27	·4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	16	2	3	5	6	8	10	11	13	14
28	·4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	15	2	3	5	6	8	9	11	12	14
29	·4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	15	1	3	4	6	7	9	10	12	13
30	·4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	14	1	3	4	6	7	8	10	11	13
31	·4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	14	1	3	4	6	7	8	10	11	13
32	·5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	13	1	3	4	5	7	8	9	10	12
33	·5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	13	1	3	4	5	6	8	9	10	12
34	·5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	13	1	3	4	5	6	8	9	10	12
35	·5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	12	1	2	4	5	6	7	8	10	11
36	·5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	12	1	2	4	5	6	7	8	10	11
37	·5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	12	1	2	4	5	6	7	8	10	11
38	·5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	11	1	2	3	4	6	7	8	9	10
39	·5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	11	1	2	3	4	6	7	8	9	10
40	·6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	11	1	2	3	4	5	7	8	9	10
41	·6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	10	1	2	3	4	5	6	7	8	9
42	·6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	10	1	2	3	4	5	6	7	8	9
43	·6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	10	1	2	3	4	5	6	7	8	9
44	·6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	10	1	2	3	4	5	6	7	8	9
45	·6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	10	1	2	3	4	5	6	7	8	9
46	·6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	9	1	2	3	4	5	5	6	7	8
47	·6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	9	1	2	3	4	5	5	6	7	8
48	·6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	9	1	2	3	4	4	5	6	7	8
49	·6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	9	1	2	3	4	4	5	6	7	8

	No.	log
π	3·14159	0·49715
e	2·71828	0·43429

$\ln x = \log_e x = (1/M)\log_{10} x$ $\quad$ $\log x = \log_{10} x = M \log_e x$

	No.	log
$(1/M)$	2·30259	0·36222
M	0·43429	1·63778

p	1	2	3	4	5	6	7	8	9	10
$\log e^p$	0·4343	0·8686	1·3029	1·7372	2·1715	2·6058	3·0401	3·4744	3·9087	4·3429
$-\log e^{-p}$	1·3657	1·1314	2·6971	2·2628	3·8285	3·3942	4·9599	4·5256	4·0913	5·6571

COMMON LOGARITHMS $\log_{10} x$

x	0	1	2	3	4	5	6	7	8	9	Δ_H	1 2 3	4 5 6	7 8 9
											+	ADD		
50	·6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	9	1 2 3	4 4 5	6 7 8
51	·7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	8	1 2 2	3 4 5	6 6 7
52	·7160	7168	7177	7185	7193	7201	7210	7218	7226	7235	8	1 2 2	3 4 5	6 6 7
53	·7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	8	1 2 2	3 4 5	6 6 7
54	·7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	8	1 2 2	3 4 5	6 6 7
55	·7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	8	1 2 2	3 4 5	6 6 7
56	·7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	8	1 2 2	3 4 5	6 6 7
57	·7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	8	1 2 2	3 4 5	6 6 7
58	·7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	8	1 2 2	3 4 5	6 6 7
59	·7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	7	1 1 2	3 4 4	5 6 6
60	·7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	7	1 1 2	3 4 4	5 6 6
61	·7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	7	1 1 2	3 4 4	5 6 6
62	·7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	7	1 1 2	3 3 4	5 6 6
63	·7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	7	1 1 2	3 3 4	5 6 6
64	·8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	7	1 1 2	3 3 4	5 6 6
65	·8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	7	1 1 2	3 3 4	5 6 6
66	·8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	7	1 1 2	3 3 4	5 6 6
67	·8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	6	1 1 2	2 3 4	4 5 5
68	·8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	6	1 1 2	2 3 4	4 5 5
69	·8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	6	1 1 2	2 3 4	4 5 5
70	·8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	6	1 1 2	2 3 4	4 5 5
71	·8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	6	1 1 2	2 3 4	4 5 5
72	·8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	6	1 1 2	2 3 4	4 5 5
73	·8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	6	1 1 2	2 3 4	4 5 5
74	·8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	6	1 1 2	2 3 4	4 5 5
75	·8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	6	1 1 2	2 3 4	4 5 5
76	·8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	6	1 1 2	2 3 4	4 5 5
77	·8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	6	1 1 2	2 3 4	4 5 5
78	·8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	6	1 1 2	2 3 4	4 5 5
79	·8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	6	1 1 2	2 3 4	4 5 5
80	·9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	5	1 1 2	2 3 3	4 4 5
81	·9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	5	1 1 2	2 3 3	4 4 5
82	·9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	5	1 1 2	2 3 3	4 4 5
83	·9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	5	1 1 2	2 3 3	4 4 5
84	·9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	5	1 1 2	2 3 3	4 4 5
85	·9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	5	1 1 2	2 3 3	4 4 5
86	·9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	5	1 1 2	2 3 3	4 4 5
87	·9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	5	0 1 1	2 2 3	3 4 4
88	·9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	5	0 1 1	2 2 3	3 4 4
89	·9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	5	0 1 1	2 2 3	3 4 4
90	·9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	5	0 1 1	2 2 3	3 4 4
91	·9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	5	0 1 1	2 2 3	3 4 4
92	·9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	5	0 1 1	2 2 3	3 4 4
93	·9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	5	0 1 1	2 2 3	3 4 4
94	·9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	5	0 1 1	2 2 3	3 4 4
95	·9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	5	0 1 1	2 2 3	3 4 4
96	·9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	4	0 1 1	2 2 2	3 3 4
97	·9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	4	0 1 1	2 2 2	3 3 4
98	·9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	4	0 1 1	2 2 2	3 3 4
99	·9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	4	0 1 1	2 2 2	3 3 4

ANTILOGARITHMS

	0	1	2	3	4	5	6	7	8	9	Mean differences								
											1	2	3	4	5	6	7	8	9
.00	1000	1002	1005	1007	1009	1012	1014	1016	1019	1021	0	0	1	1	1	1	2	2	2
.01	1023	1026	1028	1030	1033	1035	1038	1040	1042	1045	0	0	1	1	1	1	2	2	2
.02	1047	1050	1052	1054	1057	1059	1062	1064	1067	1069	0	0	1	1	1	1	2	2	2
.03	1072	1074	1076	1079	1081	1084	1086	1089	1091	1094	0	0	1	1	1	1	2	2	2
.04	1096	1099	1102	1104	1107	1109	1112	1114	1117	1119	0	1	1	1	1	2	2	2	2
.05	1122	1125	1127	1130	1132	1135	1138	1140	1143	1146	0	1	1	1	1	2	2	2	2
.06	1148	1151	1153	1156	1159	1161	1164	1167	1169	1172	0	1	1	1	1	2	2	2	2
.07	1175	1178	1180	1183	1186	1189	1191	1194	1197	1199	0	1	1	1	1	2	2	2	2
.08	1202	1205	1208	1211	1213	1216	1219	1222	1225	1227	0	1	1	1	1	2	2	2	3
.09	1230	1233	1236	1239	1242	1245	1247	1250	1253	1256	0	1	1	1	1	2	2	2	3
.10	1259	1262	1265	1268	1271	1274	1276	1279	1282	1285	0	1	1	1	1	2	2	2	3
.11	1288	1291	1294	1297	1300	1303	1306	1309	1312	1315	0	1	1	1	2	2	2	2	3
.12	1318	1321	1324	1327	1330	1334	1337	1340	1343	1346	0	1	1	1	2	2	2	2	3
.13	1349	1352	1355	1358	1361	1365	1368	1371	1374	1377	0	1	1	1	2	2	2	3	3
.14	1380	1384	1387	1390	1393	1396	1400	1403	1406	1409	0	1	1	1	2	2	2	3	3
.15	1413	1416	1419	1422	1426	1429	1432	1435	1439	1442	0	1	1	1	2	2	2	3	3
.16	1445	1449	1452	1455	1459	1462	1466	1469	1472	1476	0	1	1	1	2	2	2	3	3
.17	1479	1483	1486	1489	1493	1496	1500	1503	1507	1510	0	1	1	1	2	2	2	3	3
.18	1514	1517	1521	1524	1528	1531	1535	1538	1542	1545	0	1	1	1	2	2	2	3	3
.19	1549	1552	1556	1560	1563	1567	1570	1574	1578	1581	0	1	1	1	2	2	3	3	3
.20	1585	1589	1592	1596	1600	1603	1607	1611	1614	1618	0	1	1	1	2	2	3	3	3
.21	1622	1626	1629	1633	1637	1641	1644	1648	1652	1656	0	1	1	2	2	2	3	3	3
.22	1660	1663	1667	1671	1675	1679	1683	1687	1690	1694	0	1	1	2	2	2	3	3	3
.23	1698	1702	1706	1710	1714	1718	1722	1726	1730	1734	0	1	1	2	2	2	3	3	4
.24	1738	1742	1746	1750	1754	1758	1762	1766	1770	1774	0	1	1	2	2	2	3	3	4
.25	1778	1782	1786	1791	1795	1799	1803	1807	1811	1816	0	1	1	2	2	3	3	3	4
.26	1820	1824	1828	1832	1837	1841	1845	1849	1854	1858	0	1	1	2	2	3	3	3	4
.27	1862	1866	1871	1875	1879	1884	1888	1892	1897	1901	0	1	1	2	2	3	3	3	4
.28	1905	1910	1914	1919	1923	1928	1932	1936	1941	1945	0	1	1	2	2	3	3	4	4
.29	1950	1954	1959	1963	1968	1972	1977	1982	1986	1991	0	1	1	2	2	3	3	4	4
.30	1995	2000	2004	2009	2014	2018	2023	2028	2032	2037	0	1	1	2	2	3	3	4	4
.31	2042	2046	2051	2056	2061	2065	2070	2075	2080	2084	0	1	1	2	2	3	3	4	4
.32	2089	2094	2099	2104	2109	2113	2118	2123	2128	2133	0	1	1	2	2	3	3	4	4
.33	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	0	1	1	2	2	3	3	4	4
.34	2188	2193	2198	2203	2208	2213	2218	2223	2228	2234	1	1	2	2	3	3	4	4	5
.35	2239	2244	2249	2254	2259	2265	2270	2275	2280	2286	1	1	2	2	3	3	4	4	5
.36	2291	2296	2301	2307	2312	2317	2323	2328	2333	2339	1	1	2	2	3	3	4	4	5
.37	2344	2350	2355	2360	2366	2371	2377	2382	2388	2393	1	1	2	2	3	3	4	4	5
.38	2399	2404	2410	2415	2421	2427	2432	2438	2443	2449	1	1	2	2	3	3	4	4	5
.39	2455	2460	2466	2472	2477	2483	2489	2495	2500	2506	1	1	2	2	3	3	4	5	5
.40	2512	2518	2523	2529	2535	2541	2547	2553	2559	2564	1	1	2	2	3	4	4	5	5
.41	2570	2576	2582	2588	2594	2600	2606	2612	2618	2624	1	1	2	2	3	4	4	5	5
.42	2630	2636	2642	2649	2655	2661	2667	2673	2679	2685	1	1	2	2	3	4	4	5	6

	0	1	2	3	4	5	6	7	8	9	Mean differences								
											1	2	3	4	5	6	7	8	9
.40	2692	2696	2704	2710	2716	2723	2729	2735	2742	2748									
.41	2754	2761	2767	2773	2780	2786	2793	2799	2805	2812									
.42	2818	2825	2831	2838	2844	2851	2858	2864	2870	2877									
.43	2884	2891	2897	2904	2910	2917	2924	2931	2937	2944									
.44	2951	2958	2965	2972	2979	2985	2992	2999	3006	3013									
.45	3020	3027	3034	3041	3048	3055	3062	3069	3076	3083									
.46	3090	3097	3103	3110	3119	3126	3133	3141	3148	3155									
.47	3162	3170	3177	3184	3192	3199	3206	3214	3221	3228									
.48	3236	3243	3251	3258	3266	3273	3281	3289	3296	3304									
.49	3311	3319	3327	3334	3342	3350	3357	3365	3373	3381									
.50	3388	3396	3404	3412	3420	3428	3436	3443	3451	3459									
.51	3467	3475	3483	3491	3499	3508	3516	3524	3532	3540									
.52	3548	3556	3565	3573	3581	3589	3597	3606	3614	3622									
.53	3631	3639	3648	3656	3664	3673	3681	3690	3698	3707									
.54	3715	3724	3733	3741	3750	3758	3767	3776	3784	3793									
.55	3802	3811	3819	3828	3837	3846	3855	3864	3873	3882									
.56	3890	3899	3908	3917	3926	3936	3945	3954	3963	3972									
.57	3981	3990	3999	4009	4018	4027	4036	4046	4055	4064									
.58	4074	4083	4093	4102	4111	4121	4130	4140	4150	4159									
.59	4169	4178	4188	4198	4207	4217	4227	4236	4246	4256									
.60	4266	4276	4285	4295	4305	4315	4325	4335	4345	4355									
.61	4365	4375	4385	4395	4406	4416	4426	4436	4446	4457									
.62	4467	4477	4487	4498	4508	4519	4529	4539	4550	4560									
.63	4571	4581	4592	4603	4613	4624	4634	4645	4656	4667									
.64	4677	4688	4699	4710	4721	4732	4742	4753	4764	4775									
.65	4786	4797	4808	4819	4831	4841	4853	4864	4875	4887									
.66	4898	4909	4920	4932	4945	4955	4966	4977	4988	5000									
.67	5012	5023	5035	5047	5058	5070	5082	5093	5105	5117									
.68	5129	5140	5152	5164	5176	5188	5200	5212	5224	5236									
.69	5248	5260	5272	5284	5297	5309	5321	5333	5346	5358									
.70	5370	5383	5395	5408	5420	5433	5445	5458	5470	5483									
.71	5495	5508	5521	5534	5546	5559	5572	5585	5598	5610									
.72	5623	5636	5649	5662	5675	5689	5702	5715	5728	5741									
.73	5754	5768	5781	5794	5808	5821	5834	5848	5861	5875									
.74	5888	5902	5916	5929	5943	5957	5970	5984	5998	6012									
.75	6026	6039	6053	6067	6081	6095	6109	6124	6138	6152									
.76	6166	6180	6194	6209	6223	6237	6252	6266	6281	6295									
.77	6310	6324	6339	6353	6368	6383	6397	6412	6427	6442									
.78	6457	6471	6486	6501	6516	6531	6545	6561	6577	6592									
.79	6607	6622	6637	6653	6668	6683	6699	6714	6730	6745									
.80	6761	6776	6792	6808	6823	6839	6855	6871	6887	6902									
.81	6918	6934	6950	6966	6982	6998	7015	7031	7047	7063									
.82	7079	7095	7112	7128	7145	7161	7178	7194	7211	7228									
.83	7244	7261	7278	7295	7311	7328	7345	7362	7379	7396									
.84	7413	7430	7447	7464	7482	7499	7516	7534	7551	7568									
.85	7586	7603	7621	7638	7656	7674	7691	7709	7727	7745									
.86	7762	7780	7798	7816	7834	7852	7870	7889	7907	7925									
.87	7943	7962	7980	7998	8017	8035	8054	8072	8091	8110									
.88	8128	8147	8165	8185	8204	8223	8241	8260	8279	8299									
.89	8318	8337	8356	8375	8395	8414	8433	8453	8472	8492									
.90	8511	8531	8551	8570	8590	8610	8630	8650	8670	8690									
.91	8710	8730	8750	8770	8790	8810	8831	8851	8872	8892									
.92	8913	8933	8954	8974	8995	9016	9036	9057	9078	9099									
.93	9120	9141	9162	9183	9204	9226	9247	9268	9290	9311									
.94	9333	9354	9376	9397	9419	9441	9462	9484	9506	9528									
.95	9550	9572	9594	9616	9638	9661	9683	9705	9727	9750									
.96	9772	9795	9817	9840	9863	9886	9908	9931	9954	9977									

III Semester

M. Tech (IBT)/ Ph.D

End-Semester Examination November 2019

Paper Code: BT-7212
Time: 3 hours

Subject: Industrial Waste water treatment
Max. Marks=100 marks

Note: Answer all questions by selecting any two parts from each question. (20 marks for each question)
All questions carry equal marks
Assume suitable missing data, if any

Q1. (a) Discuss different types of microbes responsible for waste water treatment.

(b) Discuss the future of thermal power production in India and its impact on aquatic ecosystem.

(c) Discuss Ganga action plan: its action, goals and challenges.

Q2. (a) Discuss the amount of ammonia, ammonium ion, nitrite and nitrate in waste water

(b) Discuss the impact of Parali burning on Delhi city and its solutions.

(c) Write about the different water quality parameters of waste water and treated water.

Q3. (a) Describe the advanced technologies of waste water treatment.

(b) Write differences between (i) Ion exchange and reverse osmosis

(ii) Ultra-filtration and selective membrane

(c) Discuss different steps of sewage treatment plant.

Q4. (a) What are the toxic by-products generated by different industries? What is their impact on environment?

(b) How is the reclamation of a landfill achieved?

(c) What is the effect of industrial waste water on streams?

Q5. (a) What are recycling plants and how they are useful?

(b) What do you understand by waste disposal management? Explain methods of waste disposal.

(c) Discuss the effect of textile industry waste on the river ecosystem.

Total No. of Pages: 01
M. Tech. (IBT)
End Semester Examination
BT-7221 Bioethics, Biosafety and IPR

Roll No. ... .
Third Semester
(Nov.-2019)

Time: 3 hours *Max. Marks: 100*

Note: Attempt any five questions.
Each question is of 20 marks.

Q1) What is Biopiracy? Give examples of biopiracy and measures taken by government to prevent biopiracy? (20)

Q2) Differentiate between Reproductive and Therapeutic cloning. What are the scientific concerns of cloning (20)

Q3) Discuss Biosafety levels and concerns in Plant Biotechnology. Write in detail about the biosafety guidelines and regulations of Government of INDIA. (20)

Q4)What are the Initiatives taken by Indian Government on IPR in Agricultural Biotechnology. (20)

Q5. Discuss various views and opinions on the public perception of advances being made in biotechnology. (20)
Or
Discuss the public acceptance issues for Genetically Modified Food.

Q6a) Differentiate between personal and professional ethics. (2 x 10=20)
b) Explain ethical decision making model.

Total No. of Pages 02 *Roll No.* .....

FIRST SEMESTER M.Tech [GEOINFORMATICS]

END SEMESTER EXAMINATION *NOVEMBER 2019*

GEO501 REMOTE SENSING, PHOTOGRAMMETRY AND SATELLITE IMAGE PROCESSING

Time: 3:00 Hours **Max. Marks: 40**

Note: Answer any ***Five*** Questions. Question no. (1) is **compulsory.**
All questions carry equal marks.
Assume suitable missing data, if any.

Q1. (a) Define the term remote sensing and explain the stages involved in it with a diagram.
(b) Define (i) Electromagnetic energy
(ii) Electromagnetic spectrum
(c) Write the advantages of aerial photography.
(d) Define Photographic scale with example.

Q2. (a) Explain with diagrams and equations
(i) Stefan-Boltzman's law
(ii) Wien's displacement law
(b) Explain Spectral Reflectance followed by spectral reflectance curves of vegetation, soil and water with diagrams.

Q3. (a) Explain the following characteristics of satellite orbit:
(i) Orbital period
(ii) Altitude
(iii) Apogee and perigee
(iv) Swath
(b) Write a contrast between along-track and across-track scanning for remotely sensed data acquisition.

Q4. (a) Explain the following types of remote sensing imagery with their applications and sensors used to acquire them: Panchromatic data, Multispectral data, Hyperspectral data and Thermal data.
(b) Explain Film photography in terms of Black and white films, Color Films and Color infrared films.

Q5. (a) Define the following elements in visual image interpretation with the prism diagram: Primary Elements, Secondary Elements, Tertiary Elements and Higher elements
(b) Distinguish between radiometric and geometric corrections in image rectification and restoration.

Q6. (a) Give a detailed explanation of image classification process, also explain the difference between supervised and unsupervised classification along with the types of classifiers included in each category.
(b) Write in detail about remote sensing data formats, namely, BIP, BIP and BSQ with diagrams.

Q7. (a) Elaborate the hardware and software requirement with their functionality, for processing remote sensing data.
(b) Explain the following resampling techniques with their advantages and disadvantages:
(i) Nearest Neighbour approach
(ii) Bilinear Interpolation
(iii) Cubic Convolution

Total No. of Pages:02 *Roll No. .....*

FIRST SEMESTER **M.Tech [GEOINFORMATICS]**

END SEMESTER EXAMINATION ***NOVEMBER 2019***

GEO503 INTRODUCTION TO GIS AND WEB GIS

Time: 3:00 Hours **Max. Marks: 40**

Note: Answer any *Five* Questions. Question no. (1) is **compulsory**.
All questions carry equal marks.
Assume suitable missing data, if any.

Q1.

a) What is Virtual GIS?
b) What is raster to vector and vector to raster conversion? Explain how the conversion is done with diagram.
c) What is HTTP and how does it work?
d) Explain Mashup design and architecture with suitable examples.

Q2. What is database? Explain the various types of database structures with diagram.

Q3.

a) What are the types of Geospatial Web Services? Briefly explain their operations and functionalities.
b) What is OGC and why do we need it? Explain the OGC process.

Q4.

a) Explain various geoprocessing tools with diagrams.
b) Explain various raster and vector data models with diagrams.

Q5.

a) What is CGI? Explain how CGI works. Give its advantages and disadvantages.
b) What are web maps? What are the different types of maps that can be published on the web? Give examples.

Q6.

a) What is thick and thin client architecture? Explain the difference between these two architectures.

P.T.O

b) What is cloud computing? What are the various types of services provided by cloud? Give examples.

END

-70-

Total no. of Pages 02 *ROLL NO.* _____

First Semester **M.Tech.**

End Semester Examination **Nov/Dec-2019**

GEO5301 Probability Stats & Information Therory in Geoinformatics

Time: 180 minutes **Max marks 50.**

Note: Do any ten questions. All questions carry equal marks.

Q1. Eight coins are tossed together and the no. of heads resulting was noted. The operation was repeated 256 times and frequencies (f) that are obtained for different value of x, the number of heads are shown in table. Calculate median, quartiles, 4th decile and 27th percentile.

X:	0	1	2	3	4	5	6	7	8
f:	1	9	26	59	72	52	29	7	1

Q2. A five figured no. is formed by the digits 0, 1, 2, 3, 4 (without repetition). Find the probability that the number formed is divisible by 4.

Q3. A factory produces a certain type of outputs by three types of machine. The respective daily production figures are:

Machine 1: 3000 Units Machine 2: 2500 Units Machine 3: 4500 Units

Past experience shows that 1 percent of the output produced by Machine 1 is defective. The corresponding fraction of defectives for the other two machines are 1.2 percent and 2 percent respectively. An item is drawn at random from the day's production run and is found to be defective. What is the probability that it comes from the output of

(i) Machine 1 (ii) Machine 2 (iii) Machine 3 ?

Q4. Prove that two independent variables are uncorrelated, that is, r =0 but the converse is not true.

Q5. Obtain the rank correlation coefficient for the following data:

X:	68	64	75	50	64	80	75	40	55	64
Y:	62	58	68	45	81	60	68	48	50	70

P.T.O.

Q6. Obtain the equation of the line of regression of y on x for the following data. Also estimate y when x=32.

x:	23.	27.	28.	28.	29.	30.	31.	33.	35.	36.
y:	18.	20.	22	27.	21.	29.	27.	29.	28.	29

Q7. The following figures show the distribution of digits in numbers chosen at random from a telephone directory:

Digits:	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	Total
Frequency:	1026.	1107.	997.	966.	1075.	933.	1107.	972.	964.	853.	10000

Test whether the digits may be taken to occur equally frequently in the directory. $\chi^2_{0.05}$ for 9 d.f. = 16.919.

Q8. The mean weekly sales of soap bars in departmental stores was 146.3 bars per store. After an advertising campaign the mean weekly sales in 22 stores for a typical week increased to 153.7 and showed a standard deviation of 17.2. Was the advertising campaign successful? (tabulated value for t test is 1.72)

Q9. In one sample of 8 observation, the sum of the squares of deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5 percent level, given that the 5 percent point of F for n1=7 and n2=9 degree of freedom is 3.29.

Q10. A dice is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Can the dice be regarded as unbiased? Also find the limits between which the probability of a throw of 3 or 4 is most likely to lie.

Q11. A machine is producing a large number of bolts. In a box of these bolts, 95% are with in the permissible limits with respect to diameter. Seven bolts are drawn at random from the box. Determine the probability that

(a) Two, and (b) more than or equal to two, of the seven bolts are not within the permissible limits with respect to diameter.

Q12. Prove that algebraic sum of the deviations of a set of observations from their arithmetic mean is zero.

Total No. of Pages 02 *Roll No.* .....

FIRST SEMESTER M.Tech [GEOINFORMATICS]

END SEMESTER EXAMINATION *NOVEMBER 2019*

GEO5401 SURVEYING, SATELLITE GEODESY, GPS/GNSS

Time: 3:00 Hours **Max. Marks: 40**

Note: Answer any *Five* Questions. Question No. (1) is **compulsory.**
All questions carry equal marks.
Assume suitable missing data, if any.

Q1. a) GPS observables and codes
b) GPS signal structure and point positioning
c) RTK and RTD
d) Trigonometrical levelling and Tacheometric surveying

Q2. a) Design a mathematical model for point positioning with carrier phases.
b) Explain Ellipsoidal reference coordinate system in satellite geodesy.

Q3. a) Derive an expression for Ionospheric delay, Ionosheric Ratio and Noise Scale Factor.
b) Explain the concept of least square adjustment. If the interior angles of a plane triangle are $\alpha_1=41°33'$, $\alpha_2=78°57'$ and $\alpha_3=59°27'$, compute the adjusted angles using method of least square.

Q4. a) What is the need of differential positioning. Discuss different types of differencing models to mitigate various types of positioning errors.
b) Derive an expression for confidence interval for mean and variance by assuming a suitable example.

Q5. a) Derive a mathematical model for general law of propagation of variances and co-variances for linear and non-linear functions.
b) Explain the concept of covariance, correlation, cofactor and weight matrix. Calculate the correlation coefficient of the X and Y coordinates of a survey point given $\sigma_x^2=1.72$ cm^2, $\sigma_y^2=1.18$ cm^2 and $\sigma_{xy}=0.32$ cm^2.

Q6. a) Discuss the concept of bivariate normal distribution and error ellipse for survey measurements.
b) Discuss different types of advanced surveying instruments with their operating principles and applications.

End Term Examination- NOV 2019
Ist SEMESTER M Tech (GOETECHNICAL ENGG)
GTE-501 ADVANCED SOIL MECHANICS

Time: 3hr Max Marks: 40

Note: Attempt all questions. Assume the data suitably if any.

Note: Answer all questions of equal marks. Assume suitable missing data, if any.

1. Attempt all of the following questions:

(a) What are the parameters on which thickness of double layer depend. (2)

(b) What is directional variation of permeability. (2)

(c) How the degree of consolidation is determined when the variation of pore pressure is sinusoidal. (2)

(d) What is stress path suggested by Lambe's and discuss it's utility. (2)

2. Attempt any Two questions out of the following:

(a) Describe the structure of any three chief clay minerals with neat sketches. Explain differential thermal technique. (4)

(b) Explain the decay of surface potential with distance from the clay surface. Determine the thickness of double layer of a clay mineral in water. The data given: Boltzmann's constant $K=1.38 \times 10^{-16}$ erg/^{0}K, esu$=4.8 \times 10^{-10}$, Dielectric constant for water=80, Temperature $=290^0$K, Ionic valance is unity, N$= 6.02 \times 10^{23}$, Molarity$=0.86 \times 10^{-4}$ M NaCl in water. (4)

(c) What are the factors affecting pore pressure parameters. (4)

3. Attempt any Two questions out of the following:

(a) What are the empirical relations developed by various researchers for finding the coefficient of permeability of clayey soils.

For normally consolidated clay the following data is given:

Void ratio	Permeability (cm/sec)
1.15	3.08×10^{-8}
0.95	1.24×10^{-8}

Determine hydraulic conductivity of clay at a void ratio 0.67. (4)

(b) Discuss how the factor of safety against piping is determined by Harza's method and Terzaghi's method. (4)

(c) Derive the relation used for finding the discharge. Explain graphical solution proposed by Schaffernak. (4)

4. Attempt any Two questions out of the following:

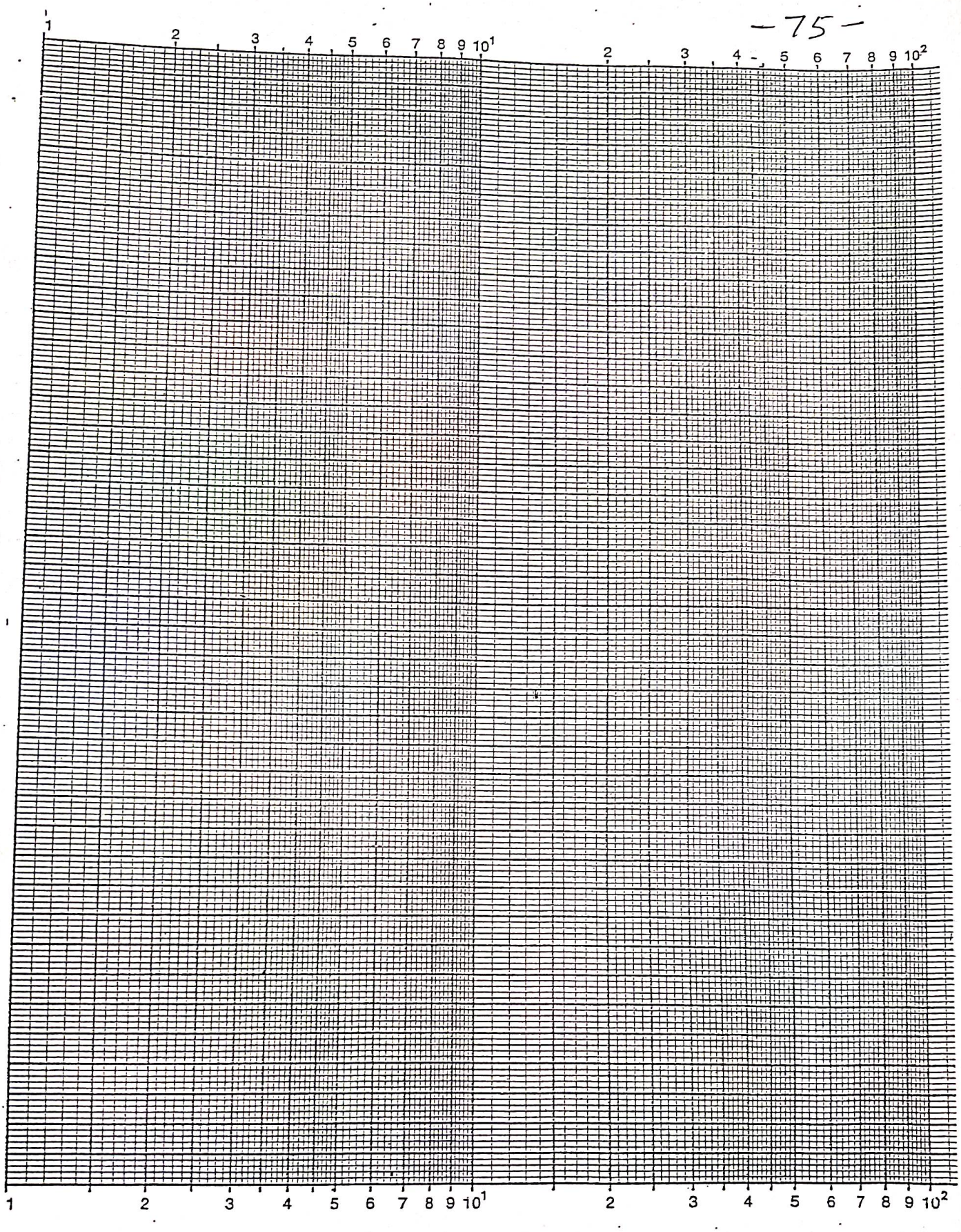
(a) The following results were obtained from an oedometer test carried out on a sample of clay. The data of void ratio (e) and effective stress were determined after equilibrium had

(b) A compacted soil was tested in unconsolidated undrained condition in triaxial apparatus with a cell pressure of 400kN/m^2.Before the application of cell pressure, the pore pressure in the sample was zero. The results obtained are as follows-

Strain (%)	Deviator stress(kPa)	Pore pressure(kPa)
0	0	240
2.5	550	280
5.0	1020	160
7.5	1160	110
9.0	1230	95
11.5	1210	75
14.0	1180	55

(i)Draw deviator stress vs strain curve.
(ii)Plot the variation Pore pressure coefficient A_f with strain
(iii) Determine the value of pore pressure coefficient B and comment upon its degree of saturation. (4)

(c) Write a note on modulus of elasticity and Poisson's ratio from triaxial tests. (4)


1 2 3 4 5 6 7 8 9 10¹
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1 2 3 4 5 6 7 8 9 10¹
2 3 4 5 6 7 8 9 10²

Roll no.....

Total no. of Pages 01
First Semester Examination
End Semester Examination

M.Tech.
Nov/Dec-2019

GTE 503 (New Course) Advance Foundation Engineering

Time: 3 hours

Marks: 100/70

Attempt all the questions
All questions carry equal marks

1 a) Suggest planning of soil exploration for different projects, methods of subsurface exploration, along with comparison of standard and cone penetration tests.

b) A thin- walled tube sampler was pushed into a soft clay at the bottom of a borehole a distance of 600 mm. When the tube was recovered, a measurement down inside the tube indicated a recovered sample length of 585mm. What is the recovery ratio, and what happened to the sample?

2 a) A square footing of 1 m is located at a depth 1.5m below the ground surface. The soil properties are:

Using bearing capacity factors calculate the ultimate bearing capacity:

(a) The water table is well below the foundation level,
(b) The water table is at the ground surface.

b) Draw a typical plot for micro-pile with and without frictional surface penetration in sandy soil. How do you obtain skin resistance and tip resistance from this plot as per your experimental program in the laboratory? How the effect of density influences the estimation of micro-pile capacity?

3 a) A 460-mm diameter pipe pile is driven closed end 15m into a cohesion less sol with an estimated ϕ angle of 34°. The soil has a γ_{wet} = 16.50 kN/m^3 and $\dot{\gamma}$= 8.60 kN/m^3. The GWT is 6m below the ground surface. Estimate the ultimate pile capacity P_u using the β method and friction angle $\delta = 22°$. What would be the effect of wall thickness 10mm to 50 mm on P_u ?

b) What is the approximate ultimate pull-out resistance T_u for a tension pile in a medium dense sand with ϕ= 36°, γ= 18.2 kN/m^3, and using an 800-mm diameter concrete pile with a length of 5m (and no bell).

4 a) Compute the efficiency of pile group of friction piles 3*5 using D=400mm, spacing =1000mm both ways, undrained shear strength of the soil is 30kPa and Piles are 20m in length. Estimate the ultimate capacity and assume that there is a 250mm cap projection beyond the outer piles.

b) A pile load test provides the following data: Pile=400 mm square concrete, L_p= 16.0 m, E_c= 27800Mpa, hammer= Vulcan 140C, e_h = 0.85, set = 6mm/blow for last 300mm and weight of pile cap= 7.61 kN. Compute ultimate and allowable pile capacity using the ENR equation.

M.TECH(AND)PHD **NO-OFPAGES-02** **ROLL. NO----------**

GTE- 5207 COMPOSITE MATERIALS

END-SEM EXAM NOV-2019

TIME- 3 HRS MAX-MARKS-50

NOTE: ATTEMPT ANY FIVE QUESTIONS BUT QUESTION NO-05 IS COMPULSORY:
ASSUME SUITABLE MISSING DATA, IF ANY

Q1. (10marks)

a)What are the Classes and Characteristics of Composite materials used in modern construction?

b) Why different Comparative Properties of composite materials used in modern construction?

Q2 **(10marks)**

a)Differentiate Advantages and Dis advantages of Polymer Matrix composite materials used in Civil Engg Constructions ?

b) What are the different Manufacturing Considerations of Polymer Matrix Composite materials used in Civil Engg Constructions?

Q3 **(10marks)**

a)What are the properties and application of Metal Matrix composite materials Used in new technologyCivil constructions?

b)Explain the Mechanical and Physical properties of composite materialsUsed in Civil modern construction?

Q4 Whrite short notes on (10marks)

a)Collassible soil on Properties of Ceramic Matrix Composites?
b) Block Cotton soil on Properties of Ceramic Matrix Composites?

Q5 **(10marks)**

a) Kindly write Abract- 350 words in research paper on composite materials like Carbon Waste used in collapsible soil on Raft foundations?

b) Kindly write Abract-350 words in research paper on composite material like Ceramic waste used in Block Cotton soil on Raft foundations?

Q6 Write Short notes on.

a) Continuous Fibers and Dis- continuous Fibers.
b) E- glass Fibers and HS – glass-Fibers

Q7 True or False

a) Phenolic resins have good high temperature resistance and less smoke
b) Vinyl esters are widely used in commercial composite applications
c) Cyanate ester resins are as moisture sensitive as epoxies
d) Bismaleimide resins are used for aerospace applications
e) Silicon carbide used as Ceramic matrix composite materials
f) Boron fibers are primarily used in polymers and metals
g) Pan based fibers are the most widely used type of carbon fibers
h) Carbon fibers generally have small and positive axial
i) Composites are important minerals which are now used Electronic packaging industries
j) Using composite materials only solution for reducing AIR pollution in delhi NCR. During winter.

Total No. of Pages 03 *Roll No. .....*

FIRST SEMESTER M.Tech. GTE

END SEMESTER EXAMINATION (November-2019)

GTE 5303 STABILITY ANALYSIS OF SLOPES

Time: 3 Hours *Max. Marks: 50*

Note: Answer all questions
Assume suitable missing data, if any

1. What are the different failure mechanisms of slope? What are the different factors of safety used for analysis of stability of slopes?

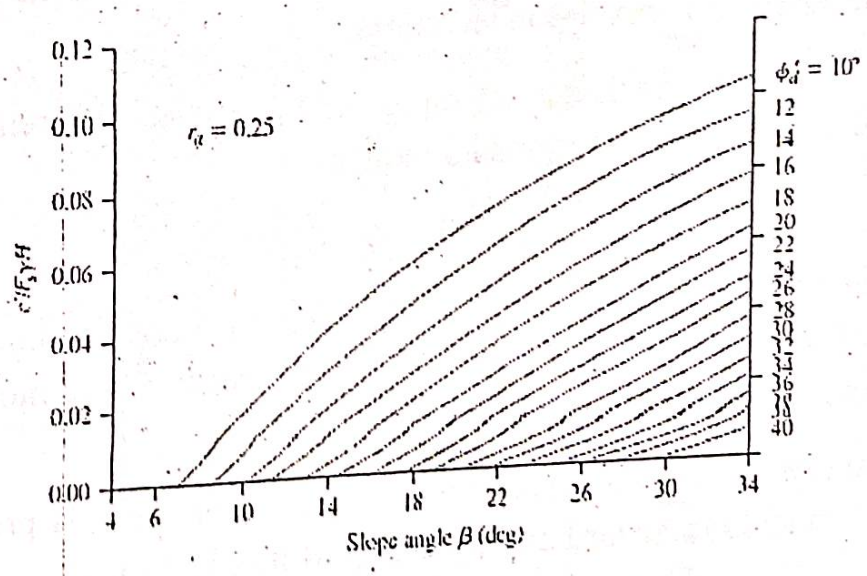
OR

A slope with $\beta=45°$ is to be constructed with a soil that has $\phi=20°$ and c = 24 kN/m2. The unit weight of the compacted soil will be 18.9 kN/m^3.

a. Find the critical height of the slope.

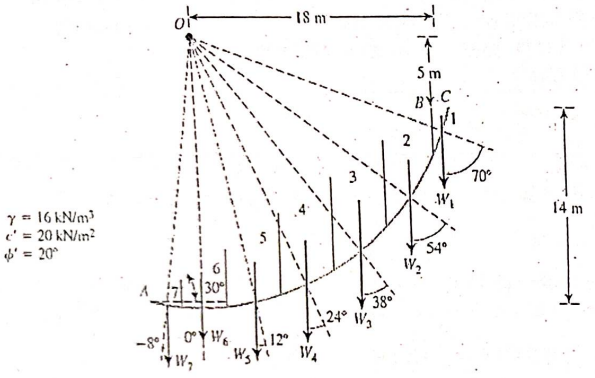
b. If the height of the slope is 10 m, determine the factor of safety with respect to strength.

2. A given slope under steady-state seepage has the following: H = 21.62 m, $\phi= 25^0$, slope: 2H:1V, c = 20 kN/m^2, γ = 18.5 kN/m^3, r_u= 0.25. Determine the factor of safety, Fs., using Spencer's solution.



OR

For the slope shown in Figure, find the factor of safety against sliding for the trial slip surface AC. Use the ordinary method of slices.



3. Explain the procedure for procedure for analysis of forces by sliding wedge method.

OR

Explain with help of suitable examples and sketches different indirect methods of landslides prevention techniques.

4. Explain with help of suitable examples and sketches different direct methods of landslides prevention techniques.

OR

Explain the different types of landslides control measures recommended for types of geo material depending upon different types of movement observed during landslides.

5. What is landslides hazard zonation map of India? How it is prepared? Prepare the landslides hazard zonation map of India.

OR

What is rainfall induced landslides? Explain its triggering process? Explain the different sensor and there architecture which can be used for developing the early warning system.

Total No. of Pages: 01

Roll No.....

FIRST SEMESTER

M.TECH (REGULAR)

END SEMESTER EXAMINATION NOVEMBER-2019

PAPER CODE GTE-5405 APPLICATION OF REMOTE SENSING AND GIS IN GEOTECHNICAL ENGINEERING

Time: 3:00 Hours *Max. Marks : 40 MARKS*

Note : Answer all the parts from each question.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a]What are Objectives of GIS?

[b]What are Components of a GIS?

[c]What are Application of GIS? 2 + 3 + 3 = 8 M

Q.2[a]In how many ways, a scale can be represented on a map? Also write down its drawbacks? 2 + 2 = 4 M

[b]Define the following terms in Geographic Coordinate System (With neat sketches): 2 + 2 = 4 M

(i) Pole (ii) Prime Meridian

Q.3[a]Explain various approaches of storing data?

[b]Explain Database and Database Management System?

[c]Explain in detail Entity Relationship Model ? 2 + 3 + 3 = 8 M

Q.4[a]What is The objective of normalization?

[b]Explain in detail GIS Data Models? 2 + 3 + 3 = 8M

[c]Differentiate between Geodatabase and Metadatabase?

Q.5[a]Explain various major principles of cartography?

[b] How the final maps of high cartographic quality are made?

[c]What is Interpolation? Differentiate between Global and Local methods of Interpolation? 2 +2 +4 = 8M

Total No. of Pages:02 Roll No.....

FIRST SEMESTER M.Tech.(REGULAR)

END SEMESTER EXAMINATION NOVEMBER-2019

PAPER CODE: GTE-5407 TITLE OF PAPER: COST MANAGEMENT OF ENGINEERING PROJECT

Time: 3:00 Hours *Max. Marks: 40*

Note : Answer all the questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Define the following terms:

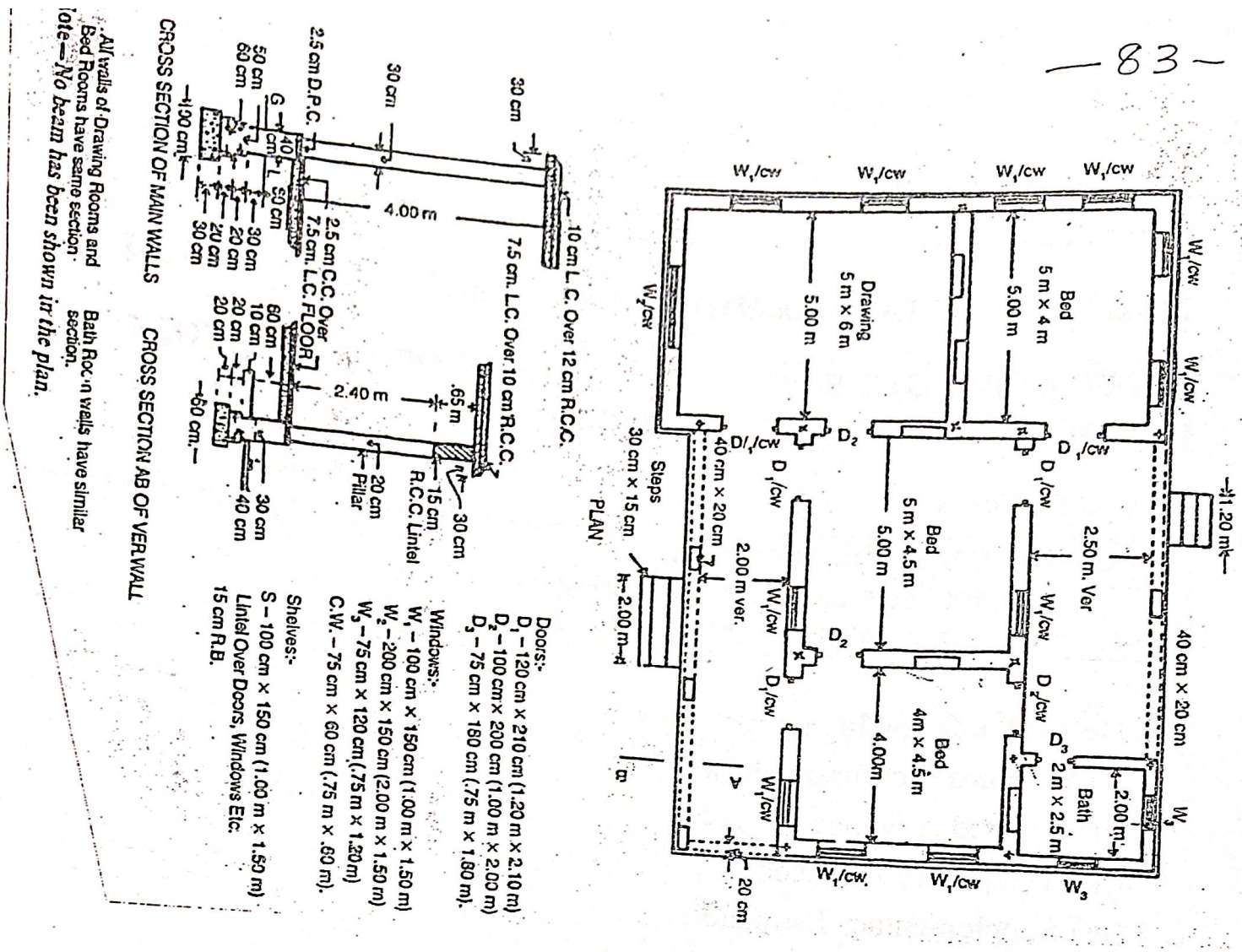
(i) Standard Measurement Book
(ii) Secured Advance
(iii) Temporary Advance
(iv) Supplementary Estimate
(v) Scrap value
(vi) Salvage value
(vii) Annuity
(viii) Book value
(ix) Capitalized value
(x) Sinking fund 1 x 10 = 10 M

Q.2[a]Write down specifications of:

(i) Plastering cement mortar
(ii) Cement concrete in Roads 2 x 4 = 8M

Q.3[a]Prepare an Estimate and abstract of cost for the following sub-heads: (See the drawing below and assume the rates of unit quantities for abstract of cost)

(i) Brickwork in foundation
(ii) Earthwork in excavation
(iii) Cement concrete in foundation 2 + 3 + 3 = 8M



Q.4 Write a Technical Reports Writing

(i) For construction of an Hospital in a Village area

(ii) For maintenance work of a Bituminous concrete road. 2 x 4 = 8 M

Q.5 Write down the Trapezoidal formula and Prismoidal formula for calculation of Earthwork for a canal in cutting. Draw a sketch of canal in cutting including berms as embankment. 8M

Total no. of pages – 1

Roll No._____ 84

M. Tech (Geotechnical Engineering)

Old

Soil Dynamics and Machine Foundation (CE 572)

END SEMESTER EXAMINATION (November-2019)

Time: 3 Hrs. Maximum Marks: 100

Note:	Answer all questions Assume suitable missing data, if any

1. a) Define D'alemberts principle. Explain the work done by the harmonic force on a harmonic motion. 10

   b) Calculate the natural frequency of vibration of a torsional pendulum with the following dimension.
   Length = 1m
   Diameter = 5mm
   Dia. of Rotator = 0.2 m
   Mass = 2kg
   $C = 0.83 \times 10^{11}$ N/m^2. 10

2. a) Describe the factors on which liquefaction of sand depends. How will you estimate the settlement of sand after liquefaction? How will you use shear wave velocity in sand deposit to determine FOS against liquefaction? 10

   b) What is active isolation and passive isolation? Describe each of them with suitable diagram. 10

3. a) What are the general rules to be taken care of to avoid possible resonance conditions? 10

   b) A Machine Foundation is supported by four pre-stressed concrete piles driven to bed rock. The length of each pile is 24 m and they are 0.3m x 0.3 m in cross section. The weight of the machine and the foundation is 1360 KN. Given unit weight of concrete=24 KN/m^3 and the modulus of elasticity of concrete used for the piles = 24.5×10^6 KPa. Determine the natural frequency of the pile-foundation system. 10

4. A foundation is subjected to a constant force type vertical vibration. Given that the total weight of the machinery and foundation block 680KN, unit weight of soil 18.5KN/m^3, Poisson's ratio 0.4, Modulus of rigidity 20700 KPa. If amplitude of the vibrating force is 7KN, the operating frequency 180cpm, and that the foundation is 6m long and 2m wide,

   a) Determine the resonant frequency. Check if $r_{esonance}/o_{perating} > 2$ 20
   b) Determine the amplitude of vibration at the resonance

   5x4 = 20

5. Write short notes on (any four)

   a) Schematic diagram of epicentre
   b) Seismic wave propagation
   c) Elastic Rebound theory
   d) Intensity of Earthquake
   e) Magnitude of Earthquake
   f) Isoseismal Maps

old

Total no. of Pages 01 Roll no.....
First Semester Examination M.Tech.
End Semester Examination Nov/Dec-2019

CE-571 (Old Course) Advance Foundation Engineering

Time: 3 hours **Marks: 100/70**

Attempt all the questions
All questions carry equal marks

1 a) Suggest planning of soil exploration for different projects, methods of subsurface exploration, along with comparison of standard and cone penetration tests.

b) A thin- walled tube sampler was pushed into a soft clay at the bottom of a borehole a distance of 600 mm. When the tube was recovered, a measurement down inside the tube indicated a recovered sample length of 585mm. What is the recovery ratio, and what happened to the sample?

2 a) A square footing of 1 m is located at a depth 1.5m below the ground surface. The soil properties are:

Using bearing capacity factors calculate the ultimate bearing capacity:

(a) The water table is well below the foundation level,
(b) The water table is at the ground surface.

b) Draw a typical plot for micro-pile with and without frictional surface penetration in sandy soil. How do you obtain skin resistance and tip resistance from this plot as per your experimental program in the laboratory? How the effect of density influences the estimation of micro-pile capacity?

3 a) A 460-mm diameter pipe pile is driven closed end 15m into a cohesion less sol with an estimated ϕ angle of 34°. The soil has a γ_{wet} = 16.50 kN/m^3 and $\dot{\gamma}$= 8.60 kN/m^3. The GWT is 6m below the ground surface. Estimate the ultimate pile capacity P_u using the β method and friction angle δ = 22°. What would be the effect of wall thickness 10mm to 50 mm on P_u ?

b) What is the approximate ultimate pull-out resistance T_u for a tension pile in a medium dense sand with ϕ= 36°, γ= 18.2 kN/m^3, and using an 800-mm diameter concrete pile with a length of 5m (and no bell).

4 a) Compute the efficiency of pile group of friction piles 3*5 using D=400mm, spacing =1000mm both ways, undrained shear strength of the soil is 30kPa and Piles are 20m in length. Estimate the ultimate capacity and assume that there is a 250mm cap projection beyond the outer piles.

b) A pile load test provides the following data: Pile=400 mm square concrete, L_p= 16.0 m, E_c= 27800Mpa, hammer= Vulcan 140C, e_h = 0.85, set = 6mm/blow for last 300mm and weight of pile cap= 7.61 kN. Compute ultimate and allowable pile capacity using the ENR equation.

Total No. of pages - 1

Roll No._____

M. Tech (Geotechnical / Structural Engineering)

—86—

Soil Structure Interaction (CE 7013 + CE 7213)

END SEMESTER EXAMINATION (November-2019)

Time: 3 Hrs. Maximum Marks: 100

Note:	Answer any Five questions Assume suitable missing data, if any

1. a) What is Winkler's model? How is this model used for elastic foundation? Write the limitations of this model. 10

   b) Derive equation for infinite beam with concentrated load using suitable boundary conditions. 10

2. a) Classify finite beams on the basis of stiffness. Explain method of superposition for analysis of finite beams. 10

   b) A 10m long finite beam rested in elastic foundation of size 0.5m x 1.1m, carries a load of 250 KN, moment 100 kN-m and u.d.l. of 200 kN/m for a span of 5m at a distance of 1m, 4m and 5m from its left end, respectively. Find vertical deflection, slope of deflected line and draw SFD and BMD. 10

3. a) List the different types of non linear load settlement response model available and explain any one of them.

   b) What is liquefaction? Discuss with neat diagram how soil liquefaction affects strength of pile. 10

4. a) What is sheet pile? Explain earth pressure on sheet pile with neat diagram?

   b) What are laterally loaded piles? How laterally loaded piles can be analyzed highlighting Reese and Matlock approach. 10

5. a) What is Hrennikof's analysis of pile group? List the assumptions made by Hrennikof's for the analyse of pile group? 10

   b) What is modulus of subgrade reaction? Explain the factors that affect modulus of subgrade reaction. 10

5x4 = 20

6. Write short notes on (any four)

   a) Elasto-Plastic soil model
   b) Time dependent behavior of elastic model
   c) Causes and effects of negative skin friction
   d) Influence Chart
   e) Factors affecting modulus of subgrade reaction

DELHI TECHNOLOGICAL UNIVERSITY, BAWANA ROAD, DELHI – 110042

DEPARTMENT OF CIVIL ENGINEERING

END SEMESTER EXAMINATION: M. Tech. (Geotechnical Engineering) November 2019

CE 7221/GTE 5305: Earth Pressure & Earth Retaining Structure

Semester: two/one

Max Marks: 100 **Time Allowed: 3 hours**

Name & Roll No.

NOTE: Attempt any *five* questions. Marks carried by a question are indicated against it. Any data missing can be assumed suitably. Write to the point and precise answers.

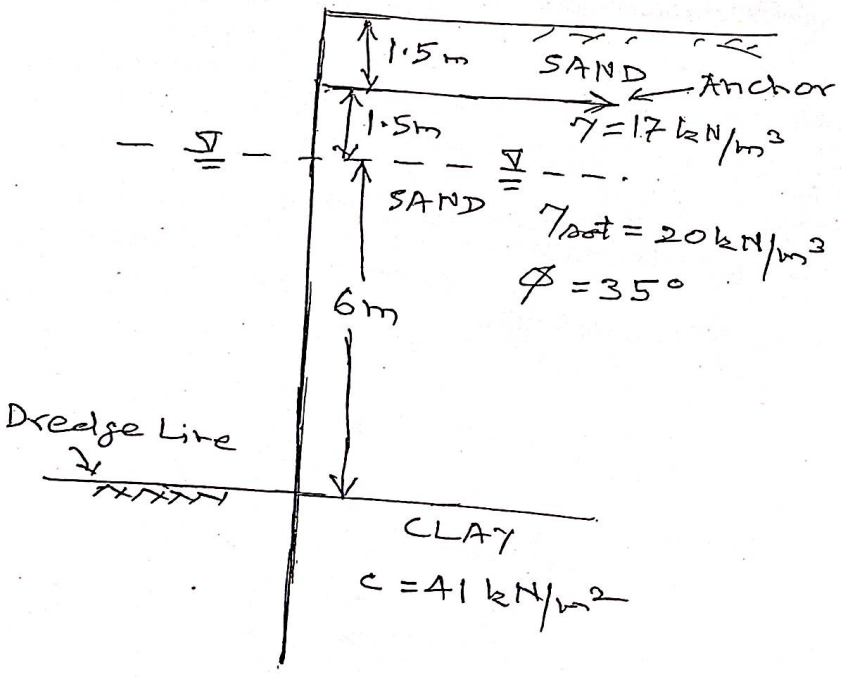
1. (a) A smooth vertical wall 6 m high, supports a saturated cohesive backfill (φ=0) with horizontal surface. The top 3 m of the backfill weighs 17.6 kN/m^3, and has an apparent cohesion of 20 kN/m^2. The bulk unit weight and apparent cohesion of the bottom 3 m of the backfill are respectively 19.2 kN/m^3 and 25 kN/m^2. Determine the likely depth of tension cracks behind the wall. If tension cracks develop, what will be the total active pressure? Sketch the pressure distribution diagram and locate the point of application of the resultant pressure. **(14)**

   (b) Explain different types of anchors used for sheet pile walls with neat sketches. **(6)**

2. (a) What is earth pressure at rest? Give various empirical correlations suggested (mention name and year) to evaluate the coefficient of earth pressure at rest. **(6)**

   (b) An anchored sheet pile wall penetrating pure saturated clay and having cohesionless backfill is shown in the figure given below. Check the stability of the sheet pile wall, draw earth pressure diagram and determine:

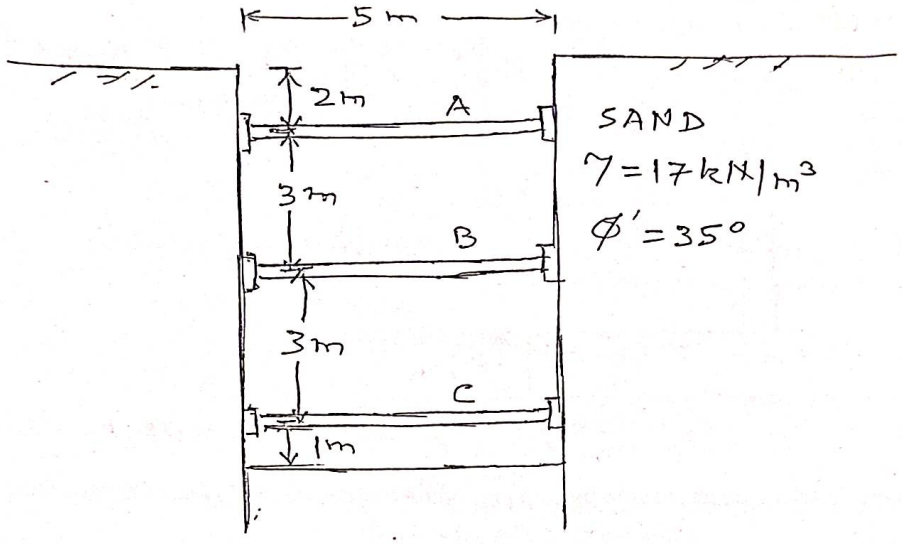
   (i) The theoretical depth of embedment of the sheet pile wall.
   (ii) The anchor force per unit length of the wall.
   (iii) The maximum bending moment in the sheet pile wall. **(14)**



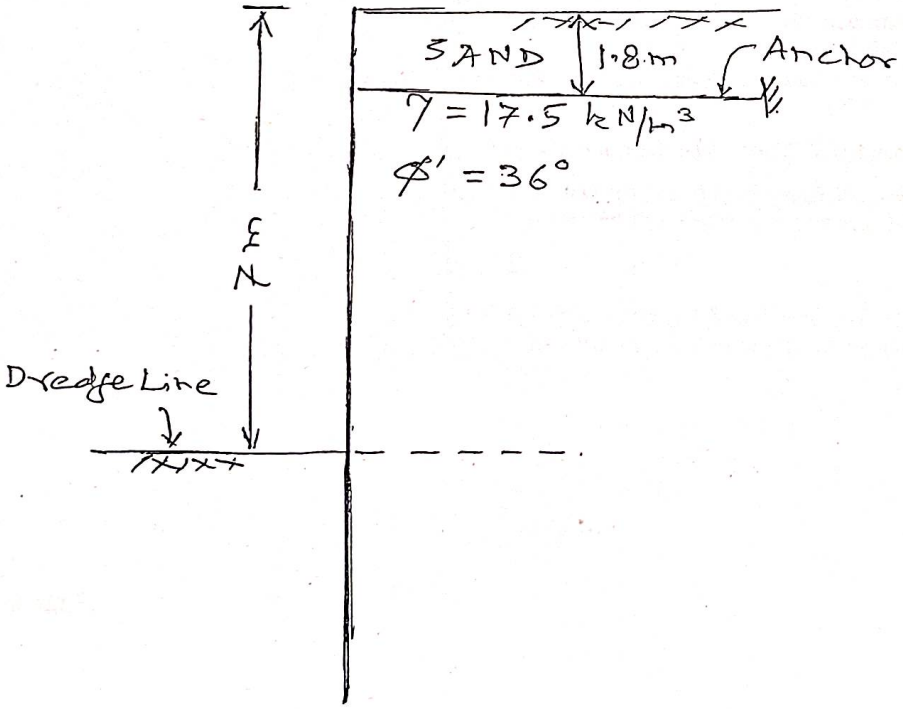
3. The height of a steel cantilever sheet pile wall above the dredge line is 6m; it retains a cohesionless soil throughout the backfill having γ=17 kN/m^3, and φ=35°. Draw a neat sketch of earth pressure diagram and determine (i) the theoretical depth of embedment of sheet pile, and (ii) the maximum bending moment in the sheet pile. **(12.5)**

4. **(a)** Giving neat sketches, describe how you will determine active earth pressure by Coulomb's theory; derive necessary equations also. **(7)**

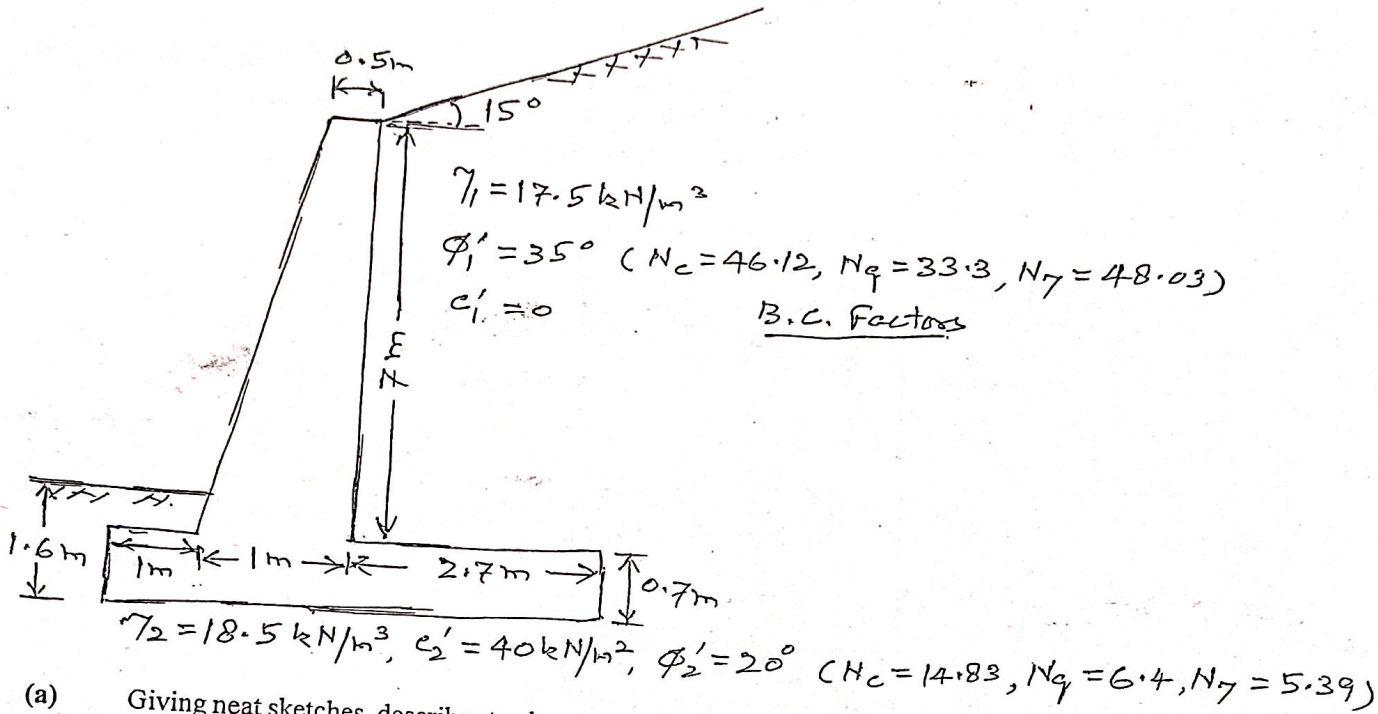
(b) The cross section of a long braced cut is shown in the figure given below. Draw Peck's earth pressure envelope and determine the strut loads at levels A, B, and C. the struts are placed at 3 m centre-to centre in the plan. Also determine the maximum bending moment in the sheet pile. **(13)**



5. A steel anchored sheet pile wall is shown in the figure given below. Draw earth pressure diagram for the sheet pile and determine the depth of embedment by using the fixed earth support method. **(20)**



6. The cross-section of an RCC cantilever retaining wall is shown in the figure given below. Calculate the factors of safety with respect to overturning, sliding, and bearing capacity failures, neglecting passive earth pressure at the toe of the wall. Indicate recommended values of respective factors of safety; and also recommend corrective measures for those cases where the factor of safety is not adequate. **(20)**



7. **(a)** Giving neat sketches, describe step by step procedure to determine passive earth pressure by Friction Circle Method. **(7)**

(b) Give step by step procedure and neat sketches for incorporating earthquake effect (Mononobe-Okabe approach) on active earth pressure in Culmann's graphical method. **(7)**

(c) With the help of a neat sketch describe the properties of a logarithmic spiral as we use it in earth pressure computations. **(6)**

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Total no. Of pages 02 *Roll No.....13.....*

FIRST SEMESTER EXAMINATION M.Tech.(HFE)
END SEMESTER EXAMINATION Nov 2019

HWE501 COMPUTATIONAL HYDRAULICS

Time : 3 Hours **Max. Marks : 100**

Note: Attempt any five questions. Draw neat labelled diagrams wherever necessary. Assume suitable missing data if any.

Q. 1(a) Discuss some of the important engineering applications of Computational Fluid Dynamics (CFD) [10]

Q. 1(b) What is the physical significance/meaning of the various terms in conservation form of momentum equation? [10]

Q. 2(a) Explain How Partial Differential Equations are mathematically classified. [10]

Q. 2(b) Write short notes on (i) Consistency (ii) Convergence (iii) Stability [10]

Q. 3(a) Write down the conservative form of the continuity equation and explain the terms involved. [10]

Q. 3(b) Write comments on governing equations of CFD. [10]

Q. 4 For the following equation:

$$\frac{\partial \emptyset}{\partial t} = D\frac{\partial^2 \emptyset}{\partial x^2}$$

(a) Obtain discretized form of finite difference quotient.
(b) Using explicit method, write algebraic equations for 4 x 4 grid.
(c) Explain any numerical method to obtain solution for Ø. [4,6,10]

Q. 5(a) How do you determine the accuracy of the discretization process? What are the uses and difficulties of approximating the derivatives with higher order finite difference schemes? How do you overcome these difficulties? [10]

Q. 5(b) What are adaptive grids? What are advantages of adaptive grids? [10]

Q. 6(a)Differentiate and distinguish between Implicit and Explicit approaches citing examples along with the advantages and disadvantages of the two. [10]

Q. 6(b)Explain explicit Lax-Wendroff numerical solution scheme for evaluation of flow field variables of interest in one dimension. [10]

Roll No.....

Total No. of Pages = 01

1ST Semester — M. Tech. (Hydraulics and Water Resources Engineering)

END SEMESTER EXAMINATION — [November 2019]

Paper - HWE-503 — **Advanced Fluid Mechanics** — Max. Marks: 40

Time: 3.00 Hours

Note: Answer ALL questions.
Assume suitable missing data, if any .

1 (a)	What do you mean by equipotential line and line of constant stream function?	2
(b)	Two discs are placed in a horizontal plane, one over the other. The water enters at the center of the lower disc and flows radially outward from a source of strength 0.628 m^2/s. The pressure, at a radius 50 mm, is 2000 KN/m^2. Find I. Pressure in KN/m^2 at a radius of 500 mm II. Stream function at angles of 30^0 and 60^0 if $\psi = 0$ at $\theta = 0$.	6
2 (a)	Differentiate between forced vortex and free vortex.	2
(b)	Explain the source flow and sink flow. Derive the expressions for the stream function and velocity potential function for source and sink pair with uniform flow.	6
	OR	
	A uniform flow with a velocity of 3 m/s is flowing over a plane source of strength 20 m^2/s. The uniform flow and source flow are in the same plane. A point P is situated in the flow field. The distance of point P from the source is 0.5 m and it is an angle of 30^0 to the uniform flow. Determine (i) stream function at point P, (ii) resultant velocity of flow at P (iii) location of the stagnation point from the source .	8
3 (a)	Explain the different types of boundary layer thickness with neat sketches.	2
(b)	Find the displacement thickness and momentum thickness for the velocity distribution as $(u/U) = 2(y/\delta)-(y/\delta)^2$, Where u is the point velocity and U is average velocity.	6
4 (a)	Describe the various types of similarities between model and prototype.	2
(b)	Explain the various types of Dimensionless Numbers and discuss different types of models with examples in practical life.	6
	OR	
	The discharge through a weir is 15 m^3/s. Find the discharge through model of the weir. The horizontal dimension scale of the model is 1:50 and vertical dimension scale of the model is 1:10.	8
5	What do you mean by Navier-Stokes equation? Derive the Navier-Stokes equations in x, y, z directions on flat plate flow problem.	8
	OR	
	Write the short notes of following i. Velocity distribution in laminar pipe flow, ii. Pressure drop in laminar pipe flow.	8

Total No. of Pages:02 Roll No.....

I SEMESTER M.Tech. (HWE)

END SEMESTER EXAMINATION *November-2019*

HWE5301-WATER POWER ENGINEERING

Time: 3:00 Hours *Max. Marks: 50*

Note: Answer Any Five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

1. (a)What are the advantages and disadvantages of Hydro-Power Plant?

(b)Determine the economical diameter of penstock pipe 500m long to carry water to a turbine having output of 1000kw at 90% efficiency against a head of 150m. Assume f=0.023

2. (a) Discuss briefly various components of storage power development.
(b) Define small hydro-power plant. How will you classify it?

3. A run-of-river plant on a stream has inflow of 20 cumecs and net head of 30m with provision of pondage to meet daily peak demand with a load factor of 60%.
(a) Determine the power generation capacity of the plant at 80% overall efficiency.

(b) The plant runs as peaking station for 3 hours and balance period in the day for average load, what amount of pondage is needed?

4. (a) Discuss briefly the various essential components of a pumped storage power plant.
(b) Define intake. Discuss various types of intakes.

PTO

5. (a) What is the specific speed of the turbines?

(b) Derive the expression for the specific speed of the turbines.

6.(a) Determine pressure rise due to sudden closure of valve at the end of a steel penstock pipe 500m long carrying water at a velocity of 5m/s. Assume =102 kg/m^3

(b) What shall be the pressure rise if the valve is closed in 2.5 minutes?

7. (a) Differentiate between a valve and a gate.

(b) Why and where hydraulic valves are provided in penstocks?

Total No. of Pages 3

Roll No.

FIRST SEMESTER

M. Tech . CIVIL {HWE}

END SEMESTER EXAMINATION NOV-2019

HWE- 5401 ADVANCED HYDROLOGY

Time: 3 Hours

Max. Marks: 40

Note : Question 1 is compulsory. Attempt 10 more questions. Assume suitable missing data, if any. Use of Yn, Sn, Kz and Gamma Function tables is allowed.

1 Answer Ten parts of the question

[a] Write basic equations used in Lumped flow routing and in Distributed flow routing techniques.

[b] State the method of flow routing used as short term method of forecasting for the Yamuna water level in Delhi.

[c] Compare the applicability of simplified models of Hydraulic flood routing techniques. Which of these models do you propose for flood routing in upper reaches of hilly terrains?

[d] Differentiate between Explicit and Implicit schemes of Kinematic wave routing with the help of relevant equations.

[e] Which model of flood routing do you propose for flow routing through a meandering river in its flood plains? Comment on applicability of lumped flow models in these rivers.

[f] Write a short note on Dam –Break flood routing.

[g] Compare annual flow time series generation with monthly flow time series generation for a river.

[h] Explain in brief applicability of different modelling approaches in Hydrology. How do you test the model before using it for data generation?

[i] Write a brief note on application of ARIMA and ARMA models in Hydrology. Give one example of each of them.

[j] Enlist few examples where regression analysis is used successfully in Hydrology.

[k] Write a brief note on flood discharge estimation by slope area method.

[l] Write a brief note on non-structural methods of flood management.

(1x10)

% of catchme area	phi –index (cm/h)	Rainfall (cm)		
		First hour	Second hour	Third hour
20	1.0	0.8	2.3	1.5
30	0.75	0.7	2.1	1.0
50	0.50	1.0	2.5	0.8

E

stimate the runoff from the catchment due to this storm.

Estimate the runoff from the catchment due to this storm. (3)

3 Discharges in a river are considered in 10 class intervals. Three consecutive years of data of the discharge in the river are given below. Draw the flow duration curve for the river and determine the 75% dependable flow.

Discharge range (m^3/s)	<6	6-9.9	10-14.9	15-24.9	25-39	40-99	100-149	150-249	250-349	>350
No. of Occurrences	20	137	183	232	16	137	121	60	30	(3)

4 Following data are from a self recording rain gauge during a storm:

Time (minutes) From beginning	00	10	20	30	40	50	60	70	80	90
Accum. Rainfall (mm)	00	20	39	48	68	92	121	150	161	166

Obtain maximum rainfall intensity occurred in a duration of 30 minutes. (3)

5 For a sub basin of area 280 km^2, the following values of Nash model coefficients were found to be appropriate : n = 3.1, K = 1.8 hrs. Determine the coordinates of 1hr UH at 3 h interval upto its peak values of the discharge. (3)

6 Flood-frequency computations for a river by using Gumbel's method, yielded the following results:

Return period T (years)	Peak flood (m^3/sec)
50	40,810
100	46,300

[illegible] the flood magnitude in this river with a return period of 500 years. (3)

7 A drainage basin has 160 km^2 area, 7 hours time of concentration and 9 hours as storage constant with the following information about inter-isochrone area distribution, determine 1 hour unit hydrograph. (3)

Time (h)	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Inter isochrones Area (km^2)	10	36	22	43	35	10	4

8 The following are the data of the monthly ground water table fluctuations and ground water pumping in certain area. Obtain a regression relation and correlation coefficients (3)

Months	1	2	3	4	5	6	7	8	9	10	11
Ground WT	3.60	4.05	4.12	4.57	4.8	4.95	5.02	4.80	4.42	4.20	3.90
GW pumping rate	14.0	23.4	32.4	51.2	62.3	79.5	61.4	47.4	34.4	18.9	1.80

9 From the following data of annual runoff depths in cm over a catchment, find if there is any trend in the data. Remove the trend by moving average method. (3)
36, 43, 44, 40, 35, 39, 41, 47, 45, 39, 52, 48.

10 Based on river flow data at a site for 10 years the following equation for Thomas-Fiering model for months of December and January was found applicable. (3)
$Q_{Dec} = 12.2 + (0.14)\,(Q_{Nov} - 81.2) + t_i\, 15.31\,(1 - 0.958^2)^{1/2}$
$QJan = 0.80 + (-0.05)\,(Q_{Dec} - 12.2) + t_i\, 1.96\,(1 - 0.039^2)^{1/2}$
Generate the probable flow sequence for next 3 months.

11 With the help of suitable example explain step by step the application of Implicit scheme of Dynamic wave routing. (3)

12 Write a brief note on the advanced topic you searched as an assignment. (3)

END

Total No of Pages: 03 Roll no.....

END SEM EXAM M.TECH

THIRD SEMESTER NOV/DEC 2019

CE7311 ENVIRONMENTAL IMPACT ASSESSMENT

MM 100 TIME 3 HOURS

Attempt all questions. Make necessary assumptions and clearly state them. ALL questions carry equal marks

1.

a. Explain (with suitable example/data) the purpose and objectives of carrying EIA for a water resource project like construction of large multipurpose dam.

b. Explain what do you mean by TMDLs and how they are determined. Explain with appropriate calculations and numeric data for any hypothetical case of river pollution.

OR

c. Explain how the impact of an industrial project, emanating sulphur dioxide, on air quality is estimated. On what factors these estimates depend. How the impact of such project is estimated on ground level concentration?

d. What are the essential monitoring requirements of various parameters as / per EIA notification rules? What do you mean by baseline environmental status? Explain these for a project for manufacturing 200 tonne per day of sulphuric acid.

2.

a. Explain the step by step procedure (flowchart) of carrying out EIA for locating a site for 'Engineered Landfill'. What are the requirements of post project monitoring?

b. How the viability of a project is determined by project proponent, prior to carrying out an EIA? How to account for unforeseen delays caused in the project? Explain with suitable data/figure etc.

OR

c. Explain the impact on the total project cost of 8000 Crore having 2-year unforeseen delay in a project of 4 years duration, which has occurred after 50% of the completion work.

Tabulation of Error Function Values

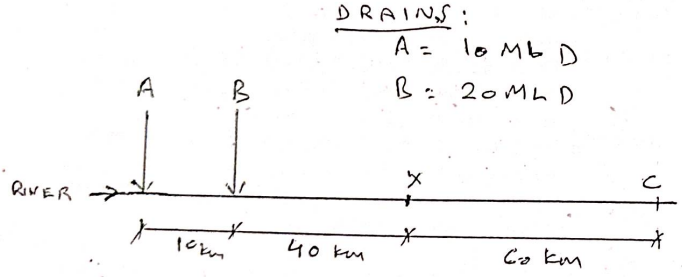
z	erf(z)	z	erf(z)	z	erf(z)	z	erf(z)	z	erf(z)
0	0	0.5	0.5204999	1	0.8427007	1.5	0.9661051	2	0.9953223
0.01	0.0112834	0.51	0.5292436	1.01	0.8468104	1.51	0.9672767	2.01	0.9955248
0.02	0.0225646	0.52	0.5378986	1.02	0.850838	1.52	0.9684135	2.02	0.9957195
0.03	0.0338412	0.53	0.5464641	1.03	0.8547842	1.53	0.9695162	2.03	0.9959063
0.04	0.0451111	0.54	0.5549392	1.04	0.8586499	1.54	0.9705857	2.04	0.9960858
0.05	0.056372	0.55	0.5633234	1.05	0.8624361	1.55	0.9716227	2.05	0.9962581
0.06	0.0676216	0.56	0.5716158	1.06	0.8661435	1.56	0.9726281	2.06	0.9964235
0.07	0.0788577	0.57	0.5798158	1.07	0.8697733	1.57	0.9736026	2.07	0.9965822
0.08	0.0900781	0.58	0.5879229	1.08	0.8733261	1.58	0.974547	2.08	0.9967344
0.09	0.1012806	0.59	0.5959365	1.09	0.8768031	1.59	0.975462	2.09	0.9968805
0.1	0.1124629	0.6	0.6038561	1.1	0.880205	1.6	0.9763484	2.1	0.9970205
0.11	0.1236229	0.61	0.6116812	1.11	0.883533	1.61	0.9772068	2.11	0.9971548
0.12	0.1347584	0.62	0.6194115	1.12	0.8867879	1.62	0.9780381	2.12	0.9972836
0.13	0.1458671	0.63	0.6270464	1.13	0.8899706	1.63	0.9788428	2.13	0.997407
0.14	0.156947	0.64	0.6345858	1.14	0.8930823	1.64	0.9796218	2.14	0.9975253
0.15	0.167996	0.65	0.6420293	1.15	0.8961238	1.65	0.9803756	2.15	0.9976386
0.16	0.1790118	0.66	0.6493767	1.16	0.8990962	1.66	0.9811049	2.16	0.9977472
0.17	0.1899925	0.67	0.6566277	1.17	0.9020004	1.67	0.9818104	2.17	0.9978511
0.18	0.2009358	0.68	0.6637822	1.18	0.9048374	1.68	0.9824928	2.18	0.9979506
0.19	0.2118399	0.69	0.6708401	1.19	0.9076083	1.69	0.9831526	2.19	0.9980459
0.2	0.2227026	0.7	0.6778012	1.2	0.910314	1.7	0.9837905	2.2	0.9981372
0.21	0.2335219	0.71	0.6846653	1.21	0.9129555	1.71	0.984407	2.21	0.9982244
0.22	0.2442959	0.72	0.6914328	1.22	0.9155339	1.72	0.9850028	2.22	0.9983079
0.23	0.2550226	0.73	0.6981037	1.23	0.9180501	1.73	0.9855785	2.23	0.9983878
0.24	0.2657001	0.74	0.7046778	1.24	0.9205052	1.74	0.9861346	2.24	0.9984642
0.25	0.2763264	0.75	0.7111554	1.25	0.9229001	1.75	0.9866717	2.25	0.9985373
0.26	0.2868997	0.76	0.7175365	1.26	0.9252359	1.76	0.9871903	2.26	0.9986071
0.27	0.2974182	0.77	0.7238214	1.27	0.9275136	1.77	0.9876909	2.27	0.9986739
0.28	0.3078801	0.78	0.7300102	1.28	0.9297342	1.78	0.9881742	2.28	0.9987377
0.29	0.3182835	0.79	0.7361032	1.29	0.9318986	1.79	0.9886405	2.29	0.9987986
0.3	0.3286268	0.8	0.7421008	1.3	0.9340079	1.8	0.9890905	2.3	0.9988568
0.31	0.3389082	0.81	0.7480031	1.31	0.9360631	1.81	0.9895245	2.31	0.9989124
0.32	0.349126	0.82	0.7538106	1.32	0.9380651	1.82	0.9899432	2.32	0.9989655
0.33	0.3592787	0.83	0.7595236	1.33	0.940015	1.83	0.9903468	2.33	0.9990162
0.34	0.3693645	0.84	0.7651426	1.34	0.9419137	1.84	0.9907359	2.34	0.9990646
0.35	0.3793821	0.85	0.7706679	1.35	0.9437622	1.85	0.991111	2.35	0.9991107
0.36	0.3893297	0.86	0.7761001	1.36	0.9455614	1.86	0.9914725	2.36	0.9991548
0.37	0.399206	0.87	0.7814397	1.37	0.9473124	1.87	0.9918207	2.37	0.9991968
0.38	0.4090095	0.88	0.7866872	1.38	0.949016	1.88	0.9921562	2.38	0.9992369
0.39	0.4187387	0.89	0.7918431	1.39	0.9506733	1.89	0.9924793	2.39	0.9992751
0.4	0.4283924	0.9	0.7969081	1.4	0.9522851	1.9	0.9927904	2.4	0.9993115
0.41	0.4379691	0.91	0.8018827	1.41	0.9538524	1.91	0.9930899	2.41	0.9993462
0.42	0.4474676	0.92	0.8067676	1.42	0.9553762	1.92	0.9933782	2.42	0.9993793
0.43	0.4568867	0.93	0.8115635	1.43	0.9568572	1.93	0.9936556	2.43	0.9994108
0.44	0.4662251	0.94	0.8162709	1.44	0.9582966	1.94	0.9939226	2.44	0.9994408
0.45	0.4754817	0.95	0.8208907	1.45	0.959695	1.95	0.9941793	2.45	0.9994694
0.46	0.4846554	0.96	0.8254236	1.46	0.9610535	1.96	0.9944263	2.46	0.9994966
0.47	0.4937451	0.97	0.8298702	1.47	0.9623729	1.97	0.9946637	2.47	0.9995226
0.48	0.5027497	0.98	0.8342314	1.48	0.9636541	1.98	0.994892	2.48	0.9995472
0.49	0.5116683	0.99	0.838508	1.49	0.9648979	1.99	0.9951114	2.49	0.9995707

d. Explain the objective criteria for selecting an EIA method. Evaluate any one method of carrying EIA using objective criteria. Also explain type of scales used in EIA methods.

3.

Estimate the minimum discharge need to be augmented in the stream at location 'X', so that the DO deficit is not less than 3.5 mg/l at any point in the stream. All the sources of pollution are discharged with $BOD_{5,20}$ =18 mg/l and D.O. equal to zero. Assume the U/S discharge of river to be 0.5 m^3/s and its DO to be 8 mg/l. The saturated DO value to be taken as 8.7 mg/l. Take k1= 0.23, k2=0.4, velocity in the stream = 0.2m/s. Also draw the D.O. profile of the stream for 100km, (i) without treatment of waste and (ii) after augmentation of the calculated discharge.

Please refer the following figure for discharge of river and drain and the confluence locations.



4 Attempt any four parts of the following

a. Model parameter estimation of QUAL 2 MODEL for relating velocity depth and width of a channel with flow rate

b. Kinetic model equations for wet air oxidation and their use

c. Life cycle assessment and its relevance to energy and environment

d. Measurements of ground level using seismic refraction method

e. Batch leach test and column tests to estimate migration rates of different contaminants through the soil

f. Salient features of QUAL 2E model for simulating impact of waste disposal on river water quality and for estimation of WLA's

g. Enhancement of stream reaeration rates by macroroughness.

5.

a. Explain the process of advection and diffusion. what is Fick's second law of diffusion, and write the expression for obtaining C(x.t), explaining all the terms. Also explain what do you mean by 'Tortuosity' and how it is useful .

b. At a landfill site, leachate accumulated over a very thick clay layer contains 1000mg/l of chloride concentration. If the tortuosity is 0.5, what would be the concentration of chloride at a depth of 1 and 3 meter after 10, 100 and 1000 years of diffusion.

-END-

Total no. Of pages 02

Roll No.....

THIRD SEMESTER EXAMINATION **M.Tech.(HFE)**
END SEMESTER EXAMINATION **Nov 2019**
CE-7322 COMPUTATIONAL HYDRAULICS

Time : 3 Hours **Max. Marks : 100**

Note: Attempt any five questions. Draw neat labelled diagrams wherever necessary. Assume suitable missing data if any.

Q. 1(a) Discuss in detail how the Partial Differential Equations are classified mathematically. [10]

Q. 1(b) Write short notes on (i) Consistency (ii) Convergence (iii) Stability [10]

Q. 2(a) Write down the conservative form of the continuity equation and explain the terms involved. [10]

Q. 2(b) Write comments on governing equations of CFD. [10]

Q. 3 For the following equation:

$$\frac{\partial \emptyset}{\partial t} = D\frac{\partial^2 \emptyset}{\partial x^2}$$

(a) Obtain discretized form of finite difference quotient.
(b) Using explicit method, write algebraic equations for 4 x 4 grid.
(c) Explain any numerical method to obtain solution for $\emptyset$. [4,6,10]

Q. 4(a) How do you determine the accuracy of the discretization process? What are the uses and difficulties of approximating the derivatives with higher order finite difference schemes? How do you overcome these difficulties? [10]

Q. 4(b) What are adaptive grids? What are advantages of adaptive grids? [10]

Q. 5(a)Differentiate and distinguish between Implicit and Explicit approaches citing examples along with the advantages and disadvantages of the two. [10]

Q. 5(b)Explain explicit Lax-Wendroff numerical solution scheme for evaluation of flow field variables of interest in one dimension. [10]

Q. 6 Discuss various approaches viz. DNS, LES, and RANS for the computational analysis of turbulent flows. [20]

Q. 7 For the case of viscous flow of air over a flat plate, the variation of flow velocity u in the direction perpendicular to the plate u is given by $u=475(1-e^{y/L})$, where L = Characteristic length = 300 mm, viscosity coefficient $\mu = 1.75 \times 10^{-5}$ kg/m.s. Descritize the flow domain above the wall plate into the nodes spaced at 25mm, 50mm, 75mm. Using the discrete values of u obtained from the velocity expression in such discritized flow domain, calculate the shear stress at the wall τ_w (i) using first one sided difference (ii) using second order one sided forward difference (iii) using third order one sided difference. Compare and comment on the computed values of such shear stresses with that of exact values of u obtained using the expression. [20]

END

Total No. of Pages 02

Roll No. — —101—

FIRST SEMESTER

M.Tech (Structural Engg.)

END SEMESTER EXAMINATION

(November – 2019)

STE501 Structural Dynamics

Time: 3:00 Hours

Maximum Marks: 40

Note: Answer **ALL** questions. All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Answer **ALL** parts of the following: **(4 x 2 = 8)**

(a) Describe the nature of Dynamic excitation. Differentiate between Free Vibration and Forced Vibration of structures.

(b) Justify that the equation of motion of a linear elastic structure is not affected by the gravity force.

(c) What do you understand by Equivalent Viscous Damping? Also determine the Equivalent Viscous Damping for Coulomb Damping.

(d) Describe the Beating phenomena with the help of neat diagram.

Q.2 Answer any **TWO** parts of the following: **(2 x 4 = 8)**

(a) Prove that the maximum deformation due to cosine force is the same that due to sinusoidal force.

(b) Derive an expression for dynamic response of an damped SDOF system subjected to harmonic loading , $F(t) = F_O \sin(\omega t)$.

(c) Describe the Half Power Band Width method for measuring damping.

Q.3 Answer any **TWO** parts of the following **(2 x 4 = 8)**

(a) A spring mass damper system consist of mass weighing 100 N and spring with stiffness of 2000 N/m. From frequency response plot to harmonic excitation, the frequency bandwidth has been observed to be 100 rpm. If the such a system is subjected to excitation of $F(t) = 25\cos\omega t$ N, Determine the amplitude of vibration after ¼ cycle and 2.5 cycles.

(b) A rotating machine having a total mass of 200 kg is supported by four isolators on a rigid floor. The total stiffness of the isolators is 1000×10^3 N/m. When operating, the machine generates a vertical harmonic force with an amplitude of 450 N at a rotation frequency of 50 Hz. Assuming that the the damping is $\xi = 0.20$, check that the amplitude of motion does not exceed the allowable amplitude of 0.03 mm and that the force which is transmitted to the floor does not exceed the allowable force of 50 N.

(c) A weight attached to a spring of stiffness 525 N/m has a viscous damping device. When the weight is displaced and released, the period of vibration is found to be 1.80 sec, and the ratio of consecutive amplitude is 4.2 to 1. Determine the amplitude and phase when a force $F = 2\cos 3t$ acts on the system.

Q.4 Answer any **TWO** parts of the following: **(2 x 4 = 8)**

(a) A SDOF system has an undamped natural frequency of 5 rad/s and a damping factor of 20%. It is given the initial conditions $x_0 = 0$ and $\dot{x}_0 = 0.5$ m/s. Determine the damped natural frequency and expression for the motion of the system for $t > 0$.

Contd.....2

(b) A harmonic is described as $x(t) = X \cos(100t + \Psi)$ mm. The initial displacement and velocity are 4.0 mm and 1.0 m/s respectively. Determine the constant X and Ψ. Also express x(t) in the form $x = A \cos(\omega t) + B \sin(\omega t)$ and determine the constants A and B.

(c) Determine the natural frequency and amplitude in the side sway for the frame shown in Fig. 1. If the initial displacement is 20 mm and the initial velocity is 20 mm/sec. Also write the expression for the displacement. Damping is 10% of critical.

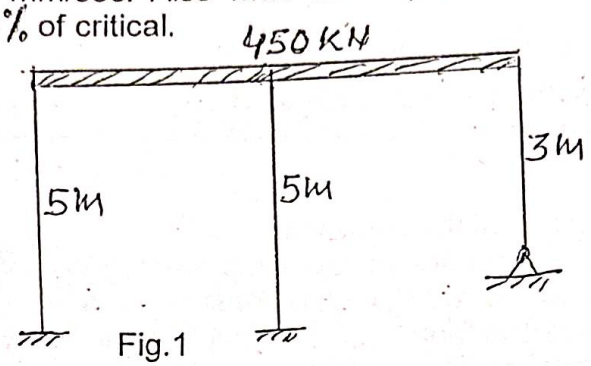


Fig.1

Q.5 Answer any **TWO** parts of the following: **(2 x 4 = 8)**

(a) Determine the natural frequencies and mode shapes for the shear frame shown in Fig. 2 prove the orthogonality of modes. Take $EI = 5 \times 10^6$ Nm^2, M = 500 kNs^2/m, span = 5 m, storey height = 3 m.

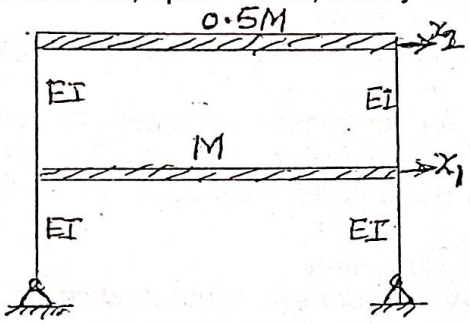


Fig.2

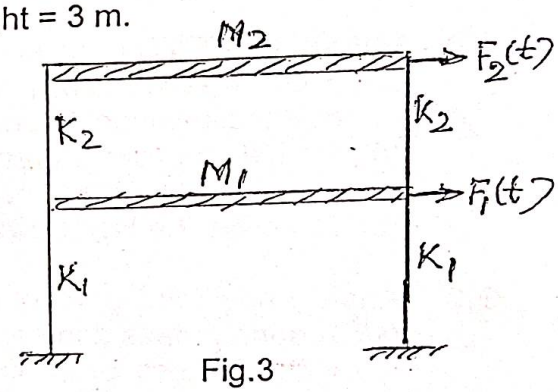


Fig.3

(b) Determine the response due to harmonic excitation for the shear frame shown in Fig.3. Take $K_1 = 2.5 \times 10^6$ N/m, $K_2 = 5.0 \times 10^6$ N/m, $M_1 = 25 \times 10^3$ kNs^2/m, $M_2 = 15 \times 10^3$ kNs^2/m, $F_1(t) = (50000 \sin 20t)$ N, $F_2(t) = 0$, storey height = 3 m.

(c) Determine the response due to harmonic excitation for the shear frame shown in Fig.4. Take $K_1 = 7.5 \times 10^6$ N/m, $K_2 = 15 \times 10^6$ N/m, $M_1 = 85 \times 10^3$ kNs^2/m, $M_2 = 60 \times 10^3$ kNs^2/m, $F_1(t) = 0$, $F_2(t) = (10000 \sin 30t)$ N, storey height = 3 m. The damping matrix is given below:

$$[C] = \begin{bmatrix} 175.23 \times 10^3 & -75 \times 10^3 \\ -75 \times 10^3 & 118.28 \times 10^3 \end{bmatrix}$$

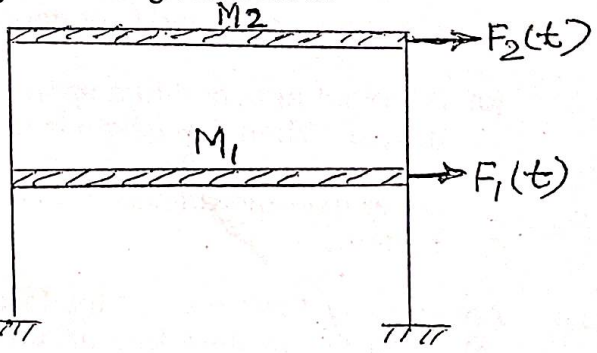


Fig.5

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M.Tech./Ph.D. I SEMESTER

Roll No.....

M.Tech. (STE) CIVIL ENGG

END SEMESTER EXAMINATION Nov. /Dec-2019

STE503: COMPUTATIONAL METHODS IN STRUCTURAL ENGG.

Time: 3:00 Hours **Max. Marks : 40**

Note : Answer any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 To find the maximum stresses in a compound cylinder, the following four simultaneous linear equations need to be solved.

$$\begin{bmatrix} 4.2857\times10^{7} & -9.2307\times10^{5} & 0 & 0 \\ 4.2857\times10^{7} & -5.4619\times10^{5} & -4.2857\times10^{7} & 5.4619\times10^{5} \\ -6.5 & -0.15384 & 6.5 & 0.15384 \\ 0 & 0 & 4.2857\times10^{7} & -3.6057\times10^{5} \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{bmatrix} = \begin{bmatrix} -7.887\times10^{3} \\ 0 \\ 0.007 \\ 0 \end{bmatrix}$$

In the compound cylinder, the inner cylinder has an internal radius of $a = 5"$ and an outer radius of $c = 6.5"$, while the outer cylinder has an internal radius of $c = 6.5"$ and an outer radius of $b = 8"$. Given $E = 30\times10^{6}$ psi, $\nu = 0.3$, and that the hoop stress in the outer cylinder is given by

$$\sigma_{\theta} = \frac{E}{1-\nu^{2}}\left[c_3(1+\nu) + c_4\left(\frac{1-\nu}{r^{2}}\right)\right]$$

Find the values of c_1, c_2, c_3 and c_4. Find the stress on the inside radius of the outer cylinder (8)

Q.2 (a) The deflection d measured at various distances x from one end of a cantilever is given by the following table. Find d when $x = 0.95$

x	0	0.2	0.4	0.6	0.8	1.0
d	0	0.0347	0.1173	0.2160	0.2987	0.3333

(4)

(b) The pressure p of wind corresponding to the velocity v is given by the following data. Estimate p, when v = 25.

v	10	20	30	40
p	1.1	2.0	4.4	7.9

(4)

Q.3 Fit a curve of the form $y = ax + bx^2$ to the following data, considering x as an independent variable

x	1	2	3	4	5
y	3	5	6	7	9

(8)

Q.4 Use the Runge-Kutta method of fourth order to calculate y(0.2) and y(0.4) for the equation $\frac{dy}{dx} = -xy, y(o) = 1.$ (8)

Q.5 Suppose you are a Civil Engineer and you are planning to use a large parabolic arch with a shape given by:

$$y = 0.1x(30 - x)$$

where y is the height above the ground and x is in meters. Calculate the total length of the arch by using Simpson's 1/3 rule. (Divide the domain from x=0 to x=30 m into 10 equally spaced intervals.) The total length of the arc is given by

$$L = \int_0^{30} \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$$

(8)

Q.6 Find the real root of the equation $x^3 - 4x - 9 = 0$ by the bisection method, correct to 4 significant figures. (8)

Total No. of Pages: 1
First Semester
END Semester Examination

RollNo:.....

M.Tech. Structural Engineering
(Nov-2019)

STE 5303: THEORY OF ELASTICITY & PLASTICITY

Time:3.0 hours

Max Marks:40

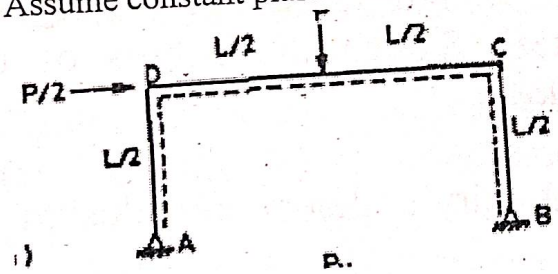
NOTE: Attempt Any 4 Questions

1. A cantilever beam of rectangular cross section 5 cm wide and 6 cm thick is 1 m in length.it carries a load of 5 kN at free end. Determine stresses in cantilever at mid length. (10)
2. a.) What to you understand by plane strain element? (3)
   b.) Determine the principle stresses for the stress tensor given below.

$$\begin{bmatrix} 15 & 10 & -10 \\ 10 & 10 & 0 \\ -10 & 0 & 40 \end{bmatrix}.$$

(7)

3. a) Explain st venant Principle? (3)
   b) Write short note on photo elastic method for calculation of principle stress (4)
   c) Express stress compatibility equation for plane stress case. (3)
4. Determine boundary condition for pure shear using airy's stress funtion for two-dimensional problem. (10)
5. Find the collapse load and draw BM diagram at collapse load for the portal frame. Assume constant plastic moment capacity Mp throughout. (10)



Total No. of Pages 02 Roll No. _____

FIRST SEMESTER **M.Tech (Structural Engg.)**
END SEMESTER EXAMINATION **(Nov/Dec - 2019)**

STE5401 Design of Advanced Reinforced Concrete Structures

Time: 3:00 Hours **Maximum Marks: 40**

Note: Answer any five questions, Ques 4 is compulsory.
Assume suitable missing data, if any.
USE of IS 456:2000 is allowed

Q1 (i) Differentiate between a bunker and a silo. 8
(ii) Structural Elements of bunker
(iii) Factors for design of chimney
(iv) Behavior of water tanks with different base conditions

Q2 Design a circular cylindrical bunker to store 20 tonnes of coal. Density of coal = 9kN/m^3, angle of repose = 30°. Use limit state method of design and adopt M20 grade concrete and Fe 415 steel. Sketch the details of the reinforcements in the bunker. 8

Q3 (i) Discuss Janssen and Airy's theory for design of silos. 2
(ii) Compare the horizontal pressures developed at 5m interval in a cement silo of internal diameter 10m and height 30m using Janssen and Airy's theories. 6
Density of cement = 15.2kN/m^3
Coefficient of friction between concrete and cement = 0.554
Coefficient of friction between filling on filling = 0.316
Angle of repose of cement = 17.5°

Q4 Design a counterfort type retaining wall with following data: 8
Height of wall above ground level = 6m
Safe bearing capacity of soil = 160kN/m^2

Angle of friction = 30°
Density of soil = 16kN/m^3
Spacing of counterforts = 3m c/c
Use M20 grade concrete and Fe 415 steel.
Design (i) toe slab (ii) Heel Slab (iii) Stem (iv) Counterfort

Q 5 A concrete chimney of height 80m with external diameter of the shaft being 4m at top and 5m at bottom is required in a place where wind intensity is 1.5kN/m^2. Thickness of brick lining is 10cm, temperature difference between the inside and outside of shaft is 75°C and permissible bearing pressure on soil site is 150kN/m^2. Design base section of the chimney using M25 grade concrete and Fe 415 steel. 8

Q 6 Design a circular tank with flexible connections at base for a capacity of 4lakh litres. The tank rests on a firm level ground. The height of tank including free board of 200mm should not exceed 3.5m. The tank is open at top. Use M20 grade concrete and Fe 415 steel. 8

Q7 Comments on the following statements: 2X 4 = 8
(i) Failures due to design and computation error
(ii) Failures due to non compliance of building codes
(iii) Failures due to improper structural detailing
(iv) Failure due to quality of construction

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Total No. of Pages:02

Roll No.....

I SEMESTER

M.Tech. (HWE)

END SEMESTER EXAMINATION *November-2019*

CE 582-WATER POWER ENGINEERING

Time: 3:00 Hours *Max. Marks: 100*

Note: Answer Any Five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

1. (a) Discuss various types of hydro-power plant. Why run-of-river plants are preferred these days over storage based plants?

(b) Design a lined power channel to carry a discharge of 250 cumecs to a power plant, side slope is 1.25:1, bed slope is 1 in 6666. Manning's n=0.018.

2. (a) Define storage power development. Does it differ from run-of-river power development?

(b) Define Penstock? What are its function in a hydro power plant?

3. (a)The runoff data of a river are 240, 200, 100, 300, 250, 150, 700, 500, 350, 275, 125, 325, 280, 400, 375, 390, 320, 140, 130 cumecs. Determine 75% dependable discharge for power generation.

(b) Define intake. Discuss various types of intakes.

4. Determine the number of turbines and diameter of a runner for a power plant having 20 cumecs inflow, 10m head, turbine has efficiency of 88%, speed 150 rpm. Assume specific speed as 250 and speed ratio of runner as 0.85.

(PTO)

-107-B-

5. (a) What is the specific speed of the turbines ?

(b) A Pelton wheel develops 5000kW under 300m head at 80% efficiency. Assuming coefficient of discharge 0.98, ratio of peripheral velocity of wheel to jet velocity 0.46, specific speed is 20, determine the diameter of bucket circle, size of buckets.

6. (a) What do you understand by trash racks in water conductor system ? Briefly mention various design considerations for trash racks.

(b) Derive expressions for water hammer in a rigid pipe and an elastic pipe

7. A penstock 2000m long and 4m in diameter has a surge tank 20m in diameter for a discharge of 30 cumecs. Friction factor f is 0.018. Normal reservoir level is 500m Determine maximum and minimum water levels in the tank.

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Total No. of Pages:02 Roll No.....

THIRD SEMESTER M.Tech. [STE] CIVIL ENGG (PT)

END SEMESTER EXAMINATION *Nov. /Dec-2019*

CE-501: Advance Mathematics & Numerical Techniques

Time: 3:00 Hours *Max. Marks: 100*

Note: Answer any Five Questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 The upward velocity of a rocket is given at three different times

Time, t	Velocity, v
s	m/s
5	106.8
8	177.2
12	279.2

The velocity data is approximated by a polynomial as:

$$v(t) = a_1 t^2 + a_2 t + a_3 , \qquad 5 \le t \le 12.$$

Find: The Velocity at t=6,7.5,9, and 11 seconds. (20)

Q.2 (a) Using Newton's forward interpolation, find the interpolating polynomial for the following data:

x:	0	1	2	3	4
f(x) :	3	6	11	18	27

(10)

(b) Using Newton's backward interpolation, find a cubic polynomial f(x) which takes the following data, and hence calculate $f(2.5)$.

x	0	1	2	3
f(x)	1	0	1	10

Q.3 (a) Find the smallest positive root of the equation $3x^3 - 9x^2 + 8 = 0$ correct to 3 decimal places using Newton-Rapson method. (10)

(b) Find the real root of equation $x^3 - 3x - 5 = 0$ by the secant method correct to 3 decimal places. (10)

Q.4 (a) Write short note on Principal of least square. (5)

(b) Fit a straight line to the following data (15)

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

Q.5 Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition y=1 at x=0, find y for x=0.1 by Euler's method, correct to 4 decimal places, taking step length h=0.02 (20)

Q.6 (a) Calculate using Simpson's 1/3 rule the value of the integral $\int_0^1 \frac{x\,dx}{1+x}$ correct to 3 significant figures taking 6 intervals.

(b) The distance covered by a rocket in meters from t=8s to t=30s is given by (10)

$$x = \int_8^{30} \left(2000 \ln\left[\frac{140000}{140000 - 2100t} \right] - 9.8t \right) dt$$

Use Simpson's 1/3 rule to find the approximate value of x. (10)

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Total No. of Pages:02 Roll No.....

THIRD SEMESTER M.Tech. [STE] CIVIL ENGG [PT]

END SEMESTER EXAMINATION *Nov. /Dec-2019*

CE-502: Advance Theory of Structures

Time: 3:00 Hours *Max. Marks: 100*

Note: Attempt any five questions
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Compare stiffness method and flexibility method of structural analysis. Why the stiffness method is preferred by software for structural analysis? What are the typical characteristics of the structure stiffness matrix?

Q.2 Generate the flexibility matrix for the structure with co-ordinates shown in Fig. 1.

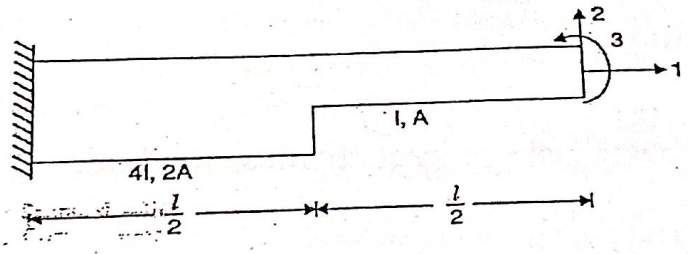

Fig.1

Q.3 Analysis the continuous beam in Fig.2 by flexibility method.

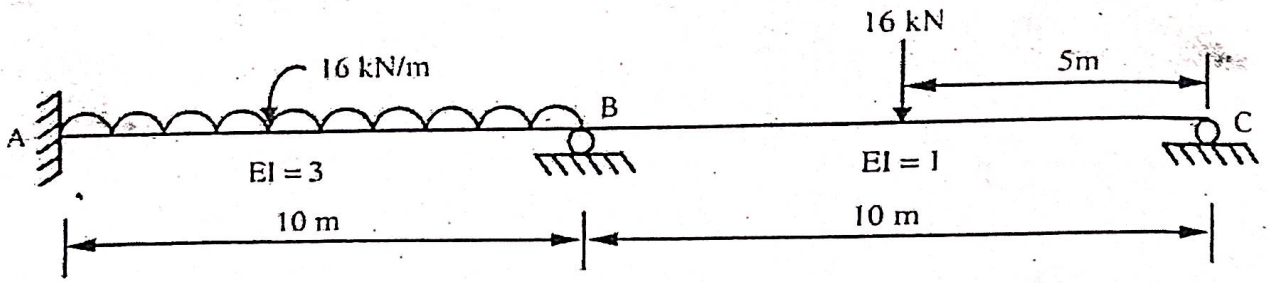

Fig.2

Q.4 Analysis the frame shown in Fig.3 by the matrix stiffness method.

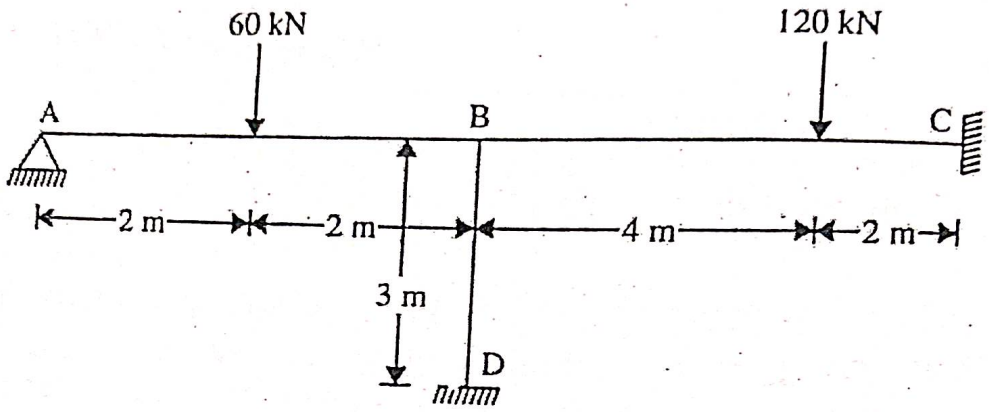

Fig.3

Q.5 Write short notes on

(i) Rigid frame structure

(ii) Shear wall structure

(iii) Coupled shear wall structure

(iv) Suspended structure

Q.6 Analysis the curved beam using direct stiffness method.

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Total No. of pages 02
I st SEMESTER

Roll No._____
M.Tech.[Civil Engg.(STR. ENGG.]
Branch/ Group code

END SEMESTER EXAMINATION NOV. 2019(Old Course)

CE503 FINITE ELEMENT METHOD OF STRUCTURAL ANALYSIS
Paper Code Title of the Subject

Time: 03 Hours Max. Marks: 100

Note: Attempt all questions. Assume suitable missing data if any.

Q.1 Answer any five parts of the following: [5.x 08 = 40]

a) Develop the shape functions of node 1 and 5 of a quadratic tetrahedron element of Lagrangian family as shown in figure 1 below.

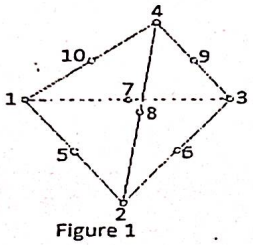


Figure 1

b) Explain how the Gauss Quadrature rule is implemented in a two-dimensional element.

c) Explain Euler Bernoulli beam model and determine stress resultants.

d) Develop the shape function of all the nodes of a quadratic rectangular element of Lagrangian family.

e) Determine the displacement field model for state variable of a beam bending problem (based on Euler Bernoulli beam model) using generalized coordinate approach, to satisfy the compatibility and completeness requirement.

f) Explain Geometric isotropy.

g) Solve this integral $\int_{-1}^{1} \frac{1}{\xi+2} d\xi$ using 2-point Gauss quadrature rule and compare the result from Trapezoidal rule, Simpson rule and the exact solution.

Q.2 Answer any four parts of the following: [4 x 10 = 40]

a) Obtain the stiffness matrix of a truss element oriented along the global coordinate axes at an angle θ with x axis using iso-parametric, 2 noded line element having C^0 continuity at element interface. Adopt one-point Gauss quadrature rule. Take AE constant.

b) Define an axisymmetric structure problem using state variables, strain vector, constitutive relationship. Establish strain displacement relationship.

c) Explain FE Model h, p and h-p mesh refinement procedures.

d) Explain the principle of virtual work formulation of a 3D elasticity problem and derive the necessary relation to get the stiffness matrix and the load vector.

e) Explain the 3D mapping relationship from global to local coordinate system for an isotropic 3D brick element, derive the relation for Jacobian matrix and relate it to nodal coordinates of a general element in global Cartesian coordinates.

f) Obtain the governing differential equations and natural boundary conditions using variational formulation for a beam problem based on Timoshenko beam model, subjected to suitable loading as shown in figure 2.

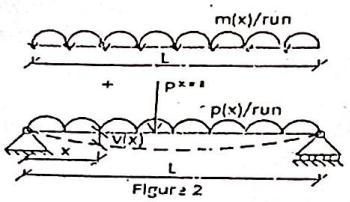


Figure 2

Q.3 Answer any two parts of the following: [2 x 10 = 20]

a) Adopt a suitable C^1 continuity beam element displacement field model based on generalized coordinate approach and derive the relationship to get the shape functions and then determine the k_{11} element of the stiffness matrix.

b) Determine the shape functions for a 3 noded c^0 continuity constant strain triangular element based on generalized coordinate approach.

c) Evaluate the Jacobian for a 4 noded quadrilateral c^0 continuity element using an iso-parametric rectangular element in local coordinates, at Gauss point 3 as shown in figure 3 below for a plane stress problem. Use 2 x 2 GQR application.

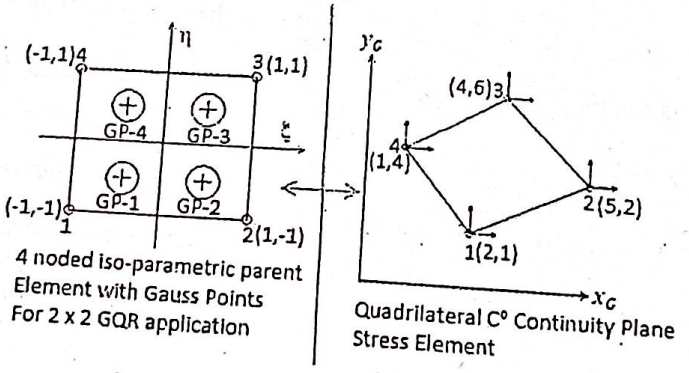


Figure 3

Total no of pages :03 Roll No.....

END SEMESTER EXAMINATION **NOV-DEC 2019**

IIIrd.Semester **M.Tech. (PT) (Structural Engineering)**

CE-551 Theory of Plates and Elastic Stability (Open Book)

Time- 3hrs. **M.M- 100**

Note: All questions carry ***equal*** marks (**16 marks** each) except Q.1 compulsory (**20 marks**). Assume any data suitably, if missing.

Q.1. Answer any ***Five*** of the following **(5 x 4 = 20 marks):**

i) Discuss different categories of failure of engineering structures.

ii) Write differences between thin plate and thick plate.

(iii) What is curvature and determine principal curvature of plate bending.

iv) What is approximate theory of bending of thin elastic plate taking into effect of shearing forces on deformation?

v) What is flexure rigidity of plate?

vi) What is the effect of axial force in plate simply supported uniformly loaded?

vii) What is right- hand- screw rule used for the sign of the angle in a elastically supported and elastically built- in edge?

viii) What is factor β depending on rigidity of restraint along edges?

Q.2. Answer any ***Three*** of the following (16 x 3 = 48 marks):

i) A long (l =1270 mm), thickness = 12.7 mm) uniformly loaded (q = 0.0689 N/mm^2) clamped rectangular plate is shown in Fig.1. Determine stresses in plate. How maximum stress is dependent on the ratio l/h and relation between load (q) and maximum stress?

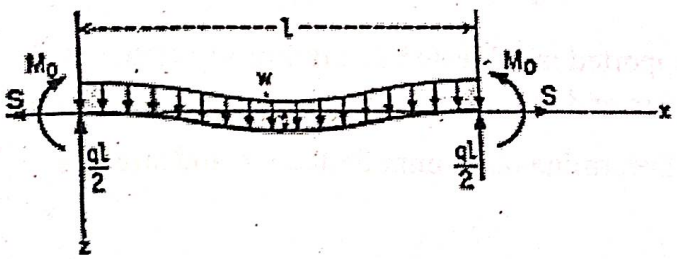


Fig.1

Fig.2

ii) A clamped circular plate 120 mm diameter and 10 mm thick is constructed from steel and subjected to a pressure of 5 N/mm^2 on one side as shown in Fig.2. Determine a) the maximum deflection and radial stress.

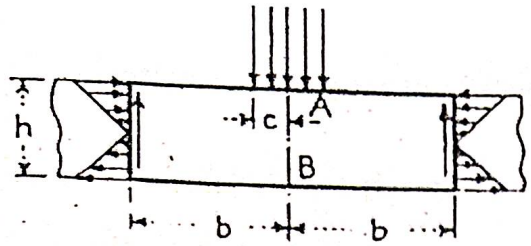


Fig.3

(iii) Determine the safe dimension of a circular steel plate loaded as shown in Fig.3. Plot stress distribution through A-B. Given data as follows: b = 2 m, c = 5 mm and h = 50 mm.

iv) A mild steel plate elastically supported and elastically built- in edge is shown in Fig.4. Take a = 4 m and thickness = 10 mm and lateral load q = 5 kNm^2 distributed over the surface. Calculate moment and shear in the plate and stress components.

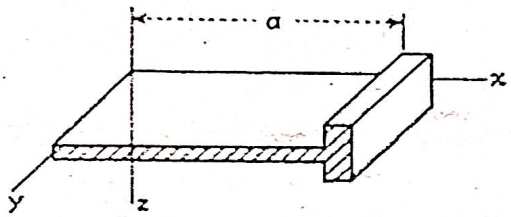


Fig.4

v) A simply supported rectangular steel plate is subjected to a sinusoidal load q = q_o Sin(πx/a).Sin(πy/b) as shown in Fig.5. Take a = 5 m, b = 3 m and thickness = 4 mm. Determine maximum deflection and stresses induced in the plate if q_o = 2 kN/m^2.

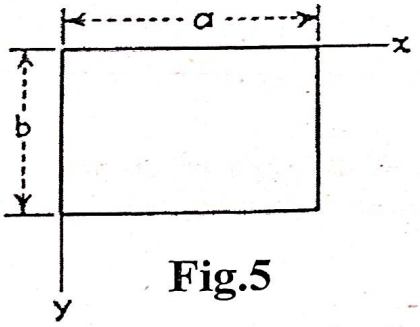


Fig.5

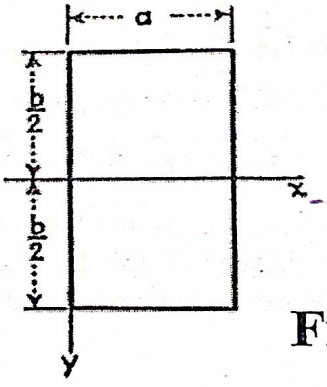


Fig.6

vi) A rectangular steel plate of two opposite edge simply supported is subjected to a uniformly distributed load (if q = 3 kN/m^2) as shown in Fig.6. Take a = 3 m, b = 6 m and thickness = 5 mm solution for deflection in the form of series w = $\sum_{m=1}^{\alpha} Ym.Sin\ (m\pi x/a)$ Determine maximum deflection and stresses induced in the plate.

Q.3. Answer any *Two* of the following (**16 x 2 = 32 marks**):

i) A simply supported steel beam of length 5 m is subjected to a moment $M_b = 2$ kNm and also acted by a lateral load of 4 kN as shown in Fig.7. From differential equation of the deflected shape determine defection at the centre and critical load. Calculate maximum B.M and stress.

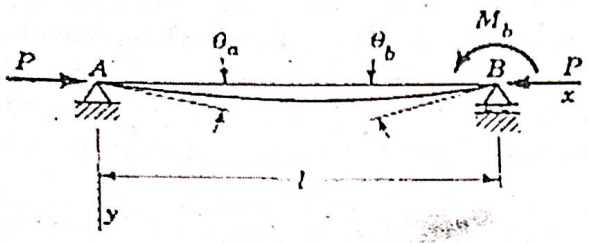
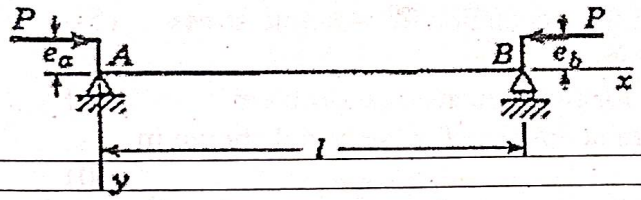


Fig.7

ii) Using the secant formulae $\sigma_{YP} = \frac{nP}{A}\left(1 + \frac{e}{s}\sec\frac{l}{2r}\sqrt{\frac{nP}{AE}}\right)$ for structural steel draw curves between σ_c (= P/A) and slenderness ratio (= l/r) assuming certain values of σ_{YP}, η and e/s.

iii) A beam- column with different eccentricity is shown in Fig.8 draw curves between σ_c (= P/A) and slenderness ratio (= l/r) for different values of $\beta = e_b / e_a$ for structural steel.

Fig.8



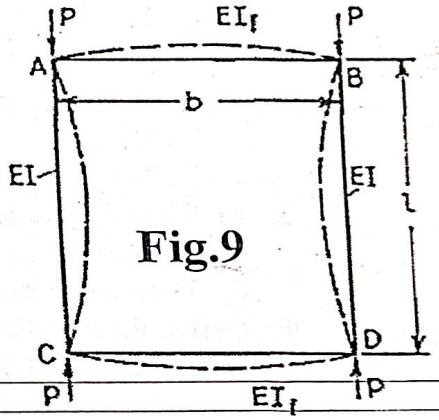


Fig.9

iv) Discuss buckling of frames as shown in Fig.9. Define stable, critical and unstable region graphically

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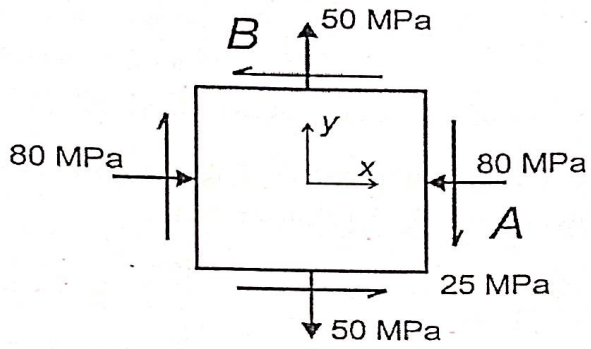
Total No. of Pages: 1
First Semester
END Semester Examination
RollNo:.....
M.Tech. Structural Engineering
(Nov-2019)
CE 552: THEORY OF ELASTICITY & PLASTICITY
Time:3.0 hours
Max Marks:100

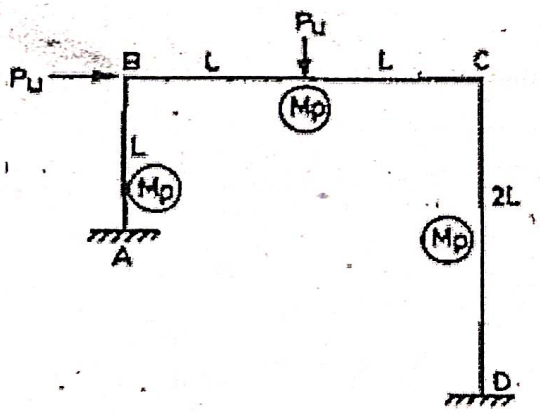
NOTE: Attempt ALL Questions

1. A cantilever beam of rectangular cross section 4 cm wide and 3 cm thick is 1.5 m in length.it carries a load of 10 kN at free end. Determine the deflection in cantilever at free end using airy's stress function. (20)
2. a.) What to you understand by plane strain element? (5)
   b.) Determine pricnciple stresses and maximum shear stress graphicaly for the element shown in figure



(15)

3. a) What do you understand by shape factor? (5)
   b) Write short note on experimental method for calculation of principle stress (5)
   c) Derive differential equation for equilibrium. (10)
4. Derive the equation of airy's stress function for two-dimensional problem. (20)
5. Find the collapse load and draw B.M diagram at collapse for the portal shown in Figure. (20)



6. a.) What to you understand by stress concentration? (5)
   b.) Derive the relation between youngs modulus, shear modulus and bulk modulus. (15)

Total No. of Pages 02

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THIRD SEMESTER

M.Tech. [Civil]

END TERM EXAMINATION *NOV-2019*

PAPER CODE: CE-7022

TITLE OF PAPER: DISASTER RESISTANT STRUCTURE

Time: 3:00 Hours *Max. Marks: 100*

Note: Attempt all questions
Assume suitable missing data, if any.
IS 875 Part III allowed.

1. Write Short Notes: 12
   a. Design Life
   b. Terrain Category
   c. Boundary layer profile
   d. Free Roof
   e. Gust Factor, Aspect Ratio
   f. Interference effects

2. Write true or false 12
   1. Wind speed above the earth's surface decreases with height.
   2. Typhoon occurs on ocean.
   3. A monoslope roof is generally subjected to suction.
   4. Edges of a sloping roof are subjected to higher pressure as compared to other parts.
   5. The force coefficients of a building with circular plan shape is a function of wind direction.
   6. A long building is to be designed for smaller wind load per unit area as compared to a small length building.
   7. A building with 50 years design life is to be designed for greater wind load per unit area as compared to a building with 25 years design life.
   8. Force coefficients on a square shape hoarding resting on ground is the same as that on a circular shape hoarding resting on ground
   9. External wind loads increase in a building increases with increase in openings on walls.
   10. Probability factor 'k_1' is not influenced by basic wind speed.
   11. Wind map of India is divided into 6 wind zones.
   12. Gradients height is more in terrain category II as compared to terrain category I.

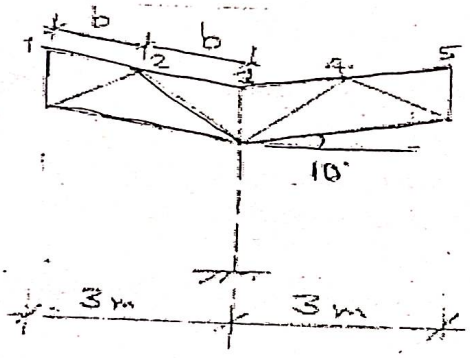
3. Describe tropical cyclone and principle for safe construction for cyclones. 16

4. Explain the method of calculating wind forces acting on a structure from the knowledge of basic wind speed. 15

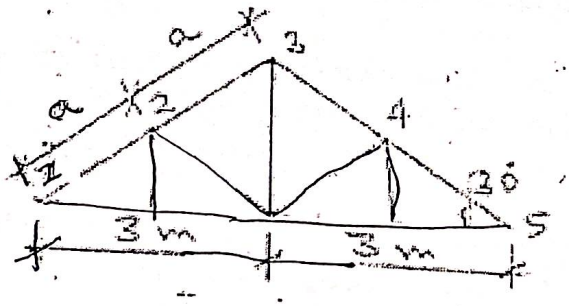
5. a. Explain in detail about the drag and lift and its effects on structures 15
b. Discuss in detail the static and dynamic effects of wind on various structures
c. What are the difference between pressure coefficient and force coefficient methods?

6. a. A 12 storey high building has rectangular plan of size 50 x 20 m. The frames are spaced at 10m centre to centre along the length and at 10 m centre to centre along the width. Evaluate the wind loads on a central frame in short direction at all floor levels when wind blows perpendicular to the long wall. Use pressure coefficients method. All other relevant data are as detailed below. 15
Building: length = 40 m, width = 12 m, storey height = 3.5 m, total height = 21 m, Design life = 50 years. Consider the building situated in cyclonic region.
Terrain & Wind: Category = 2, Topography = Flat, Basic Wind Speed = 39 m/sec

b. A troughed free roof with slope of 10^0 has plan dimensional of 24 X 6 m and eaves height as 3m. Evaluate wind loads at the nodes of the upper chord of the central truss for wind acting perpendicular to ridge if trusses are spaces at 4m centre-to centre and shape of the truss is as shown in fig. below. Take design wind speed as 50 m /sec. There is no train or stored materials. Terrain Category II.



7. A rectangular plan industrial building has length of 24m and width of 6m. it has sloping roof with eaves height as 6m and pitch of roof as 30^0. Evaulate wind loads at the nodes of the upper chord of the central truss for wind acting perpendicular to ridge if truss are spaced at 4 m centre-to centre and shape of the truss is as shown in Fig. below. Other data are design wind speed = 50 m/sec. Opening = below 5%. 15



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Total No. of Pages 2

Roll No. .....

FIRST SEMESTER

M.Tech. (SWE)

END SEMESTER EXAMINATION ***(NOVEMBER-2019)***

SWE501 SOFTWARE REQUIREMENT ENGINEERING

Time: 3 Hour *Max. Marks: 40*

Note: Question No. 1 is compulsory. Attempt any **FOUR** questions from the remaining. Assume suitable missing data, if any.

1. Answer the following questions briefly:
   a) Explain Test Requirements, Test Cases, and Procedures.
   b) How do we interpret the changes in the management of software?
   c) What is business process modeling?
   d) Explain the term traceability matrices

[2*4=8]

2. a) What is the use of requisite pro? And how are requirements typically defined in ReqPro?
   b) Built a Use Case diagram for Electricity Payment Systems.

[5+3=8]

3. CardioCare is a company exploring wearable technology, which is currently associated with two product categories- health trackers and smartwatches. Wearables are beginning to show their potential in other areas as well. Ultimately, they are likely to enter into many areas of our daily existence. Everyone controls their own health care, collecting huge quantities of personal data with the help of smart-phones, gadgets, and apps. With CardioCare system, clients start seeing their data on their smart-phones screen. Think of your data freely flowing to your own device: you will know much more about yourself, what is working, what is off track. Based on the scenario above, answer the following question:
   a) Many systems engineering problems are originated from problems with the system requirements. Explain how you can use three common

'requirements' problems that arise from the above company system context.

b) Name any four sources of requirements that are found in the above context.

[4+4=8]

4. a) Briefly explain and differentiate the term aspect-oriented and agent-based requirement engineering with suitable example.

b) Explain the case tools for Requirement Management with a suitable example.

[4+4=8]

5. a) Describe five software application areas in which software safety and hazard analysis would be a major concern.

b) Explain caliber Requirement Management and the advantage of using it.

[4+4=8]

a) Turner says to "test" every requirement statement by hypothesizing a few simple test cases that reasonably objective people might agree would verify the given requirement. He claims this will help improve the "quality" of the set of requirements derived. What are the strengths and weaknesses of this approach to requirements quality?

b) Which elicitation techniques will you use to elicit the requirements of the above system? why?

[4+4=8]

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7. Answer all the following questions:

[a] Students of a class are classified as Brilliant, Leader, or Intelligent based on performance parameters: Aptitude, and Communication Skill (on a scale of 10) as given in Table-II. Use *k*-NN algorithm to classify a new student Rakesh [Aptitude = 5, Communication = 4.5]. Consider two cases: K=1, and K=3. Comment on the performance of *k*-NN algorithm in above cases. [3]

Table-II

Name	Aptitude	Communication	Class
Adarsh	2	5	Leader
Vineet	2	6	Leader
Ruby	7	6	Brilliant
Aneesh	7	2.5	Intelligent
Mradul	6	4	Intelligent
Parul	4	7	Leader
Govind	5	3	Intelligent
Parimal	3	5.5	Leader
Ravi	8	3	Intelligent
Pradeep	6	5.5	Leader

[b] Consider the following data set consisting of the scores of two variables (X_1, X_2) on each of seven individuals: [5]

Table-III

Individual (ID)	X_1	X_2
A	1.0	1.0
B	1.5	2.0
C	3.0	4.0
D	5.0	7.0
E	3.5	5.0
F	4.5	5.0
G	3.5	4.5

Divide the above data into two clutters using *k*-mean algorithm. Find the centroid of each cluster. Use L_2 norm as a distance measure.

----*END*----

Total No. of Pages: 4 *Roll No. .....*

FIRST SEMESTER **M. Tech. (SE)**

END SEMESTER EXAMINATION *November-2019*

SWE5303 ARTIFICIAL INTELLIGENCE

Time: 3:00 Hours *Max. Marks: 50*

Note: Answer any *FIVE* questions. **Question No. 1** is compulsory.
Assume suitable missing data, if any.
Use only **optimal** number of words in answers.

1. Answer all the following questions:

[a] What is meant by state-space search? Explain with an example. [3]

[b] Consider the game of tic-tac-toe with all required assumptions. Write an intelligent Program for playing tic-tac-toe. Explain, what are the basic characteristics of an intelligent Program? [5]

[c] Consider following set of data point: $X^{(1)} = [0,0]^T$, $X^{(2)} = [0,1]^T$, $X^{(3)} = [1,0]^T$, and $X^{(4)} = [1,1]^T$. The class levels of these data points are given by $Y = [0,1,,1,0]$. Show that the decision boundary between class '0' and '1' cannot be obtained by single perceptron. [5]

[d] A decision surface between two classes A and B given by $W^T X + W_0 = 0$. Consider a point X_A in class A. Derive the formula for that margin (distance from decision boundary to point X_A). [5]

2. Answer all the following questions:

[a] What is meant by heuristic? Explain with an example. [3]

[b] Consider a graph shown in Fig. 1. Perform breadth-first search (BSF) to find the goal node G starting from node A. Compare the complexity of the algorithm with Depth-first search (DFS). [5]

3. Answer all the following questions:

[a] Write the algorithm for Best-first-search and compare with steepest-assent algorithm. [3]

[b] Find the optimal path between node S and node G using A* algorithm for graph shown in Fig. 2. Cost transition from a node to next node is shown over each branch. The heuristic value of each node is given as (pair wise): (S, 7), (A, 6), (B, 2), (C, 1), (G, 0). [5]

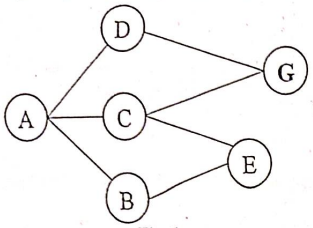

Fig. 1

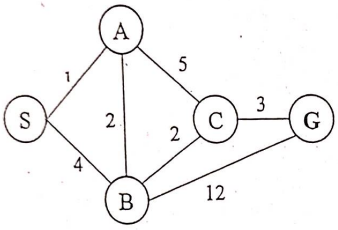

Fig. 2

4. Answer all the following questions:

[a] Describe the concept of And-or graph using example of matrix multiplication. [3]

[b] Consider the following game tree shown in Fig. 3 in which static score are all from the first player's point of view. Suppose first player is maximizing player. What move should be chosen? What nodes would not need to be examined using alpha-beta pruning procedure? [5]

5. Answer all the following questions:

[a] Consider two fuzzy sets given as below:

$$\tilde{A}=\left\{\frac{1}{2}+\frac{0.3}{4}+\frac{0.5}{6}+\frac{0.2}{8}\right\},\ \tilde{B}=\left\{\frac{0.5}{2}+\frac{0.4}{4}+\frac{0.1}{6}+\frac{1}{8}\right\}$$

Find: (i) $\tilde{A}\cup\tilde{B}$ (ii) $\tilde{A}\cap\tilde{B}$ (iii) core of fuzzy sets in obtained in part (i) & (ii). [3]

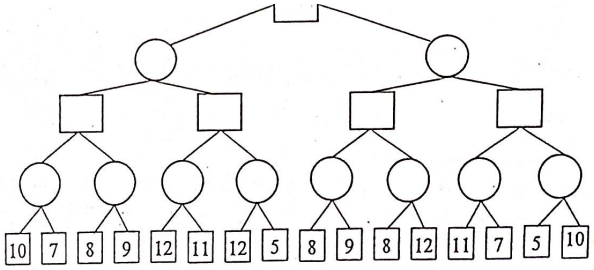

Fig. 3

[b] Data for ten matches played between Team A and Team B is given in Table-I, with respect to Team A. Design a Naïve Bayes classifier using given data, and predict the result for a given condition: [Green, Low, First]. [5]

Table-I

S. No.	Pitch Color	Wind Speed	Batting	Result
1.	Green	High	First	Win
2.	Green	High	First	Loss
3.	Green	High	First	Win
4.	Brown	High	First	Loss
5.	Brown	High	Second	Win
6.	Brown	Low	Second	Loss
7.	Brown	Low	Second	Win
8.	Brown	Low	First	Loss
9.	Green	Low	Second	Loss
10.	Green	High	Second	Win

6. Answer all the following questions:

[a] Consider a dataset of m samples for two-class classification. Let us apply logistic regression for classification. The cost function for logistic regression is given as: [6]

$$J(\mathrm{W})=-\frac{1}{m}\sum_{i=1}^{m}\left(y^{(i)}\log\left(h_{\mathrm{w}}(\mathbf{X}^{(i)}\right)+(1-y^{(i)})\log\left(1-h_{\mathrm{w}}(\mathbf{X}^{(i)})\right)\right)$$

Here output $y=1$ represent class 1 and $y=2$ represent class 2. There are m samples, $i=1,2,\ldots,m$. $h(\mathbf{X}^{(i)})$ is the estimated probability of the output variable $y=1$ for input $\mathbf{X}^{(i)}$. Show that cost function have can be optimized using the Gradient descent algorithm.

[b] Explain the basic concept of the support vector machine (SVM). Also, label support vector in a two-dimensional classification example. [2]

Total No. of Pages:02
1ST SEMESTER
END SEMESTER EXAMINATION

Roll No.....
M.Tech (SE)
(Nov/Dec 2019)

SWE 503 Object Oriented Software Engineering

Time: 3:00 Hours **Max. Marks: 40**

Note: Q1 is compulsory. Attempt any four from the rest.
Assume suitable missing data, if any.

1. [a] Compare and contrast the Object oriented methodology of Booch, Rumbaugh and Jacobson. (4)

[b] What is RUP? Explain various phases of RUP along with their outcomes. (4)

2. Air ticket reservation (AIR) system is a software required to automate the Reservation System for an Airline at an Airport or elsewhere Primary task deals with the following functionalities:

- Maintenance of user account
- Maintenance of flight database i.e. flight number, timing number of seats etc.
- Reservation of Air tickets
- Cancelling of Air tickets
- Enquiry about flight schedules, fares, timings etc.
- Reports regarding day-to-day bookings, ticket availability, passengers database etc.

Air Ticket may be issued on demand for any flight to and from any destination for any date and in any class as desired by the passenger depending on the availability.

After any issue or cancellation of the ticket the corresponding information has to be updated so that the ticket availability shows the status of the seats actually available/unavailable. Enquiries made by the passenger also need to be furnished disclosing the timing and availability of flight and air tickets in particular classes for the dates provided by the enquirer.

For the sale of an air ticket or for its cancellation, money will be paid or refunded and thus there will be need for account maintenance, which may include ledger, sale book receipt etc.
The system is expected to be able to help in the running of the air ticket reservation counter at an airport or elsewhere, thus helping in the overall functioning of any airlines government or private.
There will also be kept a detailed account of all the passenger list for all flights thus aiding in cross checking any information that may be of use to the airline or any other authorities.

[a] Create an initial requirement document (4)

[b] Draw the use case diagram. (4)

3 Consider the AIR case study given in question 2 and identify the classes their relationship and draw class diagram. (8)

4 Consider the AIR case study given in question 2. Consider 'Airlin Reservation' use case and draw the sequence diagram. (8

5 Consider the 'Airline Reservation' use case of AIR case study given i question 2 and create scenario matrix, test case matrix and assign actu values to the test cases. (8

6 [a] Consider traffic light system. Draw its statechart diagram. Specify th rules according to which the system is controlled. (4

[b] Consider the process of creating a document in Microsoft Wor Draw its activity diagram. State the necessary assumptions. (4

7 [a] What is state based testing? What are alpha and omega states? Li the advantages and limitations of state based testing. (4

[b] Consider queue class and create test cases based on state base testing. (4

-END-

Total no. of Pages: 02 *Roll no.....*

End Term Exam **Nov-2019**

Ist Semester **M.Tech.(SWE)**

Paper Code: SWE5401 AD BMS

Duration: 3 Hrs. **Max Marks: 40**

NOTE: Attempt all the questions. Assume the missing data, if any.

Q1. a) Explain with the help of an example how to evaluate an expression containing multiple operations. (4)

b) When is it preferable to use a dense index than a sparse index? (4)

Q2. a) What is recoverable schedule? Why is the recoverability desirable? Explain with suitable example. (5)

b) What is the purpose of compensating transactions? Give two examples of their use. (3)

Q3. a) Compute the canonical cover of the following set of functional dependencies for relation schema. (3)

R = (A, B, C, D, E)

$$A \rightarrow BC$$
$$CD \rightarrow E$$
$$B \rightarrow D$$
$$E \rightarrow A$$

b) Explain the commit protocols used in Distributed Database Systems. (5)

Q4. a) Discuss the algorithm used for the computation of the query cost involving selection operation in relations. (4)

b) Explain the greedy algorithm used in Decision-Tree Classification technique. (4)

P.T.O.

Q5. Define the following terms (any four): (4*2=8)

a) Materialization
b) Data Partitioning
c) OLAP
d) Association rules
e) Interoperation parallelism

END

Total No. of Pages: 02 *Roll No. .....*

~~SIXTH~~ SEMESTER – I M. Tech. (CSE)

END SEMESTER EXAMINATION ***November-2019***

CO-561 ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer any ***FIVE*** questions. Question no. 1 is compulsory Assume suitable missing data, if any.

1. Answer all the following questions: [2x6=12]

[a] Considering tic-tac-toe game, explain what is an intelligent program?

[b] Describe Turing test for intelligence machine. Also, give major characteristics of intelligent machine.

[c] Describe table based and percept based agent architecture.

[d] What is Bayes' rule?

[e] What is meant by intelligent program? Explain with example.

[f] What is heuristic search?

2. Answer all the following questions:

[a] Describe Breath First Search (BFS) and compare with Depth First Search (DFS). [3]

[b] What is meant by state-space search? Explain it using water jug problem. [4]

3. Consider 8-puzzle consists of 8 tiles and one empty space where the tiles can be moved. Start and goal states of the puzzle are shown in Fig. 1. The puzzle can be solved by moving the tiles one by one in the single empty space. Instead of moving the tiles in the empty space we can visualize moving the empty space in place of the tile, basically swapping the tile with the empty space. The empty space can only move in four directions viz. up, down, left, and right. Find optimal path from start node to goal node using A* algorithm. Use g-score: number of nodes from start node to current node; h'-score: the number of misplaced tiles by comparing the current state and the goal state space and thus achieving the Goal configuration. [7]

P.T.O.

1	2	3
8		4
7	6	5

Start Sate

2	8	1
	4	3
7	6	5

Goal State

Fig. 1

4. With the help of Tic Tae Toe game, show how Min max procedure help in deciding a good move for maximizing player. [7]

5. Answer all the following questions:
   [a] Explain the working of the artificial neural network (ANN) with the help of a neat diagram. [3]
   [b] Define fuzzy sets and compare with classical sets. Also comment how it is different from probability theory. [4]

6. Answer all the following questions:
   [a] Explain Simulated Annealing Algorithm and compare with gradient descent algorithm. [3]
   [b] Draw the architecture of Expert system defining functionality of different components. [4]

7. Answer all the following questions:
   [a] What are the merits and demerits of semantic nets and frames? [3]
   [b] State and explain an evolutionary algorithm for optimal search. [4]

----*END*----

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Total No. of Pages 2 Roll No.....

3RD SEMESTER **M.Tech. (SE)**

END SEMESTER EXAMINATION **(Nov-Dec – 2019)**

SWE 7111 Advances in Software Engineering

Time: 3:00 Hours **Max. Marks: 100**

Note: Attempt any **FIVE** questions. Question No. 1 is mandatory.

Q1 (a) What are different types of software risks. Differentiate between reactive and proactive risk strategies.

(b) Define cleanroom software engineering. What makes cleanroom different?

(c) Explain characterization function in domain engineering.

(d) Discuss different CASE shell design techniques. **(4x5=20)**

Q2 (a) Explain the concept of meta data and meta activity models. Differentiate them with the help of suitable examples.

(b) Explain a simple safety critical system. **(2x10=20)**

Q3 Explain the concept of risk identification in risk management. Discuss its various components and drivers. Also, explain the process of developing risk table and assessing risk impact in risk projection. **(20)**

Q4 (a) Discuss the economics of CBSE and its impact on three key drivers.

(b) Describe the classification and retrieval of components. Describe reusable components and reuse environment with diagram in detail.

(2x10=20)

Q5 Discuss the process of cleanroom design refinement and verification. Also, list the advantages of design verification. What is statistical use testing and explain the concept of certification in cleanroom testing.

(20)

Q6 Write short notes: **(Any four)** (4X5=20)

a) Decision Oriented Meta Models

b) The RMMM Plan

c) Component Based Systems

d) System Reliability

e) CAM Engineering

-END-

Total no. of Pages: 02 *Roll no.....*

End Term Exam **Nov-2019**

Ist Semester **M.Tech.(CSE)**

Paper Code: CSE501 ADBMS

Duration: 3 Hrs. **Max Marks: 40**

NOTE: Attempt all the questions. Assume the missing data, if any.

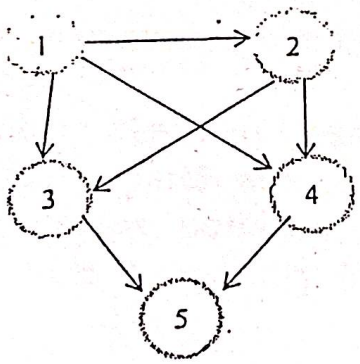
Q1.a) Discuss with suitable example how updates are made in dense indices. (4)

b) Explain why the allocation of records to blocks affects database-system performance significantly. (4)

Q2. a) List any five Equivalence rules used in query optimization with the help of an example. (4)

b) Describe the transformation of an ER schema to relational schema with the help of a suitable example. (4)

Q3. a) Consider the following precedence graph. Is the corresponding schedule conflict serializable? Explain your answer. (3)



b) List the ACID properties. Explain each with the help of suitable example. (5)

Q4. a) Give an algorithm for 2 PC Coordinator in Distributed DBMS. (3)

b) Elucidate the following in terms of Parallel Databases with the help of suitable diagrams: (5)

i) Partitioning schemes
ii) Query parallelism

Q5. Differentiate between: (4x2=8)

a) Sparse and dense Indexing
b) BCNF and 3NF
c) Sequential and multitable clustering file organization
d) Interquery and Intraquery parallelism

END

Total no of pages:02
End Semester Examination
M.Tech

Roll No.....
Nov-Dec: 2019
First Semester

Advance Algorithms and Data Structures (CSE503)

Total Time: 3 hr.

Full Marks-40

Attempt all questions.

Q 1. (a) Consider a complete weighted graph G with 100 vertices numbered from V0, V1, to V99. The edge weight between two vertices Vi and Vj is |i-j|. Find out the cost of Maximum Spanning Tree obtained from G.

(b) . Suppose you have an array of n elements containing only two distinct keys, true and false. Give an O(n) algorithm to rearrange the list so that all false elements precede the true elements. You may use only constant extra space.

(c) Design a linear-time algorithm which, given an undirected graph G and a particular edge e in it, determines whether G has a cycle containing e.

(d) Give an algorithm to find a maximum spanning tree. Is this harder than finding a minimum spanning tree?

(e) Consider two complex numbers z1=x1+iy1 and z2=x2+iy2 each of size n where real and imaginary parts are of equal size. Usual multiplication of these two complex numbers require $O(n^2)$ time complexity. Try to reduce this time complexity by using the idea of divide and conquer approach. [2*5=10]

Q2 (a) *Local sequence alignment.* Often two DNA sequences are significantly different, but contain regions that are very similar and are *highly conserved.* Design an algorithm that takes an input two strings x[1 . . . n] and y[1 : . . m] and a scoring matrix δ and outputs substrings x′ and y′ of x and y, respectively, that have the highest-scoring alignment over all pairs of such substrings. Your algorithm should take time O (mn). [7]

P.T.O

(b) A bipartite graph is a graph $G(V, E)$ whose vertices can be partitioned into two sets $V=V1 \cup V2$ and $V1 \cap V2=\varphi$, such that there are no edges between vertices in the same set. Give a linear-time algorithm to determine whether an undirected graph is bipartite. [3]

Q3(a) What do you mean by P, NP and NP complete problems? Give examples for each. Prove that Clique problem is a NP complete problem. [6]

(b) What do you mean by approximation algorithm? Solve vertex cover problem using the idea of approximation algorithm. [4]

Q4 (a). "Edit distance" measures the minimum the number of simple changes to move from one string to another. Possible changes include the insertion of a single character, the deletion of a single character, or the substitution from one character to another. All the operations are of equal costs. For Example:- Edit Distance for input sequences "*sunday*" and "*saturday*" is 3. Last three and first characters are same. We need to convert '*un*' to '*atur*': This can be achieved by inserting character '*a*', inserting character't' and replacing character '*n*' with character '*r*'. Develop a strategy to find the minimum edit distance between two strings using Dynamic Programming. Your program must calculate edit distance between pairs of strings for the said strings. [7]

(b) What do you mean by topological ordering in a directed graph (G)? Write down the algorithm for finding topological ordering in G? [3]

-End-

Total No. of Pages :1 Roll No.....

FIRST SEMESTER M.TECH. [CSE]

END SEMESTER EXAMINATION (Nov. /Dec. - 2019)

Paper Code: CSE5307 Subject: Parallel Computer Architecture

Time: 3:00 Hours *Max. Marks: 50*

Note: Attempt any five questions. All questions carry equal marks.

1.(a) Explain Flynn's classification of computer system architecture with neat and clean diagram and suitable examples. 5

(b) Compare the PRAM model with physical model of parallel computers in which PRAM variant can be best model SIMD machines and how? 5

2. (a) Discuss grain packing and scheduling with suitable examples and also discuss node duplication mechanism in a static multiprocessor system. 5

(b) Describe Tomasulo's and scoreboarding techniques for dynamic scheduling in details. 5

3.(a) Differentiate between implicit and explicit parallelism and also discuss Hardware and Software parallelism with suitable examples. 5

(b) Describe the branch effect and branch prediction in detail. And also define the performance degradation factor due to branch prediction. 5

4.(a) Explain pipelining by calculating the speedup that may be achieved through pipeline versus base scalar machine. Using a diagram show that how deliberate delay insertion in a pipeline could improve the throughput of the machine. 5

(b) Discuss Amdahl's law and Gustafson's law in detail. 5

5.(a) Explain the various network properties and differentiate between static and dynamic inter connection networks with examples. 5

(b) What is cache coherence problem? Discuss various protocol to solve the cache coherence problem. 5

6.(a) For given pipeline reservation table: 5

	T1	T2	T3	T4	T5	T6	T7
S1	X					X	
S2			X				X
S3		X		X			
S4			X		X		

(i). Determine the latencies in the forbidden set and the initial collision vector.
(ii). Draw the state transition diagram for scheduling the pipeline.
(iii) Draw the MAL.
(iv) Draw the speedup and efficiency of the pipeline.

(b) Draw and define the architecture and instruction format of a VLIW processor. 5

7. Write short notes on the following: 2.5X4

(i). Perfect shuffle and exchange.
(ii). C/S Access memory organization.
(iii) Control Hazards.
(iv) CRAY X-MP

7. Answer all the following questions:

[a] Students of a class are classified as Brilliant, Leader, or Intelligent based on performance parameters: Aptitude, and Communication Skill (on a scale of 10) as given in Table-II. Use *k*-NN algorithm to classify a new student Rakesh [Aptitude = 5, Communication = 4.5]. Consider two cases: K=1, and K=3. Comment on the performance of *k*-NN algorithm in above cases. [3]

Table-II

Name	Aptitude	Communication	Class
Adarsh	2	5	Leader
Vineet	2	6	Leader
Ruby	7	6	Brilliant
Aneesh	7	2.5	Intelligent
Mradul	6	4	Intelligent
Parul	4	7	Leader
Govind	5	3	Intelligent
Parimal	3	5.5	Leader
Ravi	8	3	Intelligent
Pradeep	6	5.5	Leader

[b] Consider the following data set consisting of the scores of two variables (X_1, X_2) on each of seven individuals: [5]

Table-III

Individual (ID)	X_1	X_2
A	1.0	1.0
B	1.5	2.0
C	3.0	4.0
D	5.0	7.0
E	3.5	5.0
F	4.5	5.0
G	3.5	4.5

Divide the above data into two clutters using *k*-mean algorithm. Find the centroid of each cluster. Use L_2 norm as a distance measure.

----*END*----

Total No. of Pages: 4 *Roll No. .....*

FIRST SEMESTER **M. Tech. (CSE)**

END SEMESTER EXAMINATION *November-2019*

CSE5401 ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer any *FIVE* questions. Assume suitable missing data, if any. Use of scientific calculator is permitted. Use only **optimal** number of words in answers.

1. Answer all the following questions:

[a] Consider that your goal is to navigate a robot out of a maze. The robot starts in the center of the maze facing north. You can turn the robot face in the north, east, south or west direction. You can direct the robot to move forward a certain distance, although it will stop before hitting a wall. Given the above information, is it possible to formulate this problem? If yes, formulate the problem, else give the reason for it. How large is the state space for the above problem? [3]

[b] Consider the game of tic-tac-toe with all required assumptions. Write an intelligent Program for playing tic-tac-toe. Explain, what are the basic characteristics of an intelligent Program? [5]

2. Answer all the following questions:

[a] What is meant by heuristic? Explain with an example. [3]

[b] Consider a graph shown in Fig. 1. Perform breadth-first search (BSF) to find the goal node G starting from node A. Compare the complexity of the algorithm with Depth-first search (DFS). [5]

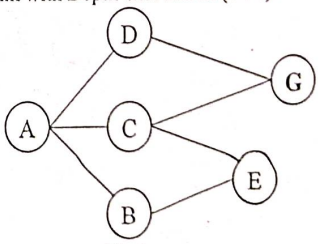


Fig. 1

3. Answer all the following questions:

[a] Write the algorithm for Best-first-search and compare with steepest-assent algorithm. [3]

[b] Find the optimal path between node S and node G using A* algorithm for graph shown in Fig. 2. Cost transition from a node to next node is shown over each branch. The heuristic value of each node is given as (pair wise): (S, 7), (A, 6), (B, 2), (C, 1), (G, 0). [5]

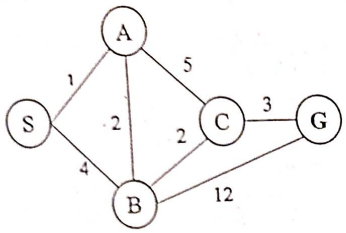


Fig. 2

4. Answer all the following questions:

[a] Describe the concept of And-or graph using example of matrix multiplication. [3]

[b] Consider the following game tree shown in Fig. 3 in which static score are all from the first player's point of view. Suppose first player is maximizing player. What move should be chosen? What nodes would not need to be examined using alpha-beta pruning procedure? [5]

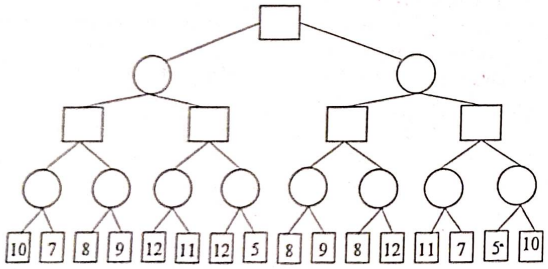


Fig. 3

5. Answer all the following questions:

[a] Consider two fuzzy sets given as below:

$$\tilde{A}=\left\{\frac{1}{2}+\frac{0.3}{4}+\frac{0.5}{6}+\frac{0.2}{8}\right\},\ \tilde{B}=\left\{\frac{0.5}{2}+\frac{0.4}{4}+\frac{0.1}{6}+\frac{1}{8}\right\}$$

Find: (i) $\tilde{A}\cup\tilde{B}$ (ii) $\tilde{A}\cap\tilde{B}$ (iii) core of fuzzy sets in obtained in part (i) & (ii). [3]

[b] Data for ten matches played between Team A and Team B is given in Table-I, with respect to Team A. Design a Naïve Bayes classifier using given data, and predict the result for a given condition: [Green, Low, First]. [5]

Table-I

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8.	Brown	Low	First	Loss
9.	Green	Low	Second	Loss
10.	Green	High	Second	Win

6. Answer all the following questions:

[a] Consider a dataset of m samples for two-class classification. Let us apply logistic regression for classification. The cost function for logistic regression is given as: [6]

$$J(\mathrm{W})=-\frac{1}{m}\sum_{i=1}^{m}\left(y^{(i)}\log\left(h_{\mathrm{w}}(\mathrm{X}^{(i)}\right)+(1-y^{(i)})\log\left(1-h_{\mathrm{w}}(\mathrm{X}^{(i)}\right)\right)$$

Here output $y = 1$ represent class 1 and $y = 2$ represent class 2. There are m samples, $i = 1,2,\ldots,m$. $h(\mathrm{X}^{(i)})$ is the estimated probability of the output variable $y = 1$ for input $\mathrm{X}^{(i)}$. Show that cost function have can be optimized using the Gradient descent algorithm.

[b] Explain the basic concept of the support vector machine (SVM). Also, label support vector in a two-dimensional classification example. [2]

III Sem

Total No of Pages
MTech
END SEMESTER EXAMINATION
Time: 3 hours

Roll No.....

(Nov/Dec 2019)
Maximum Marks: 100

Note: Attempt all Questions, Assume suitable missing data

Distributed Systems, CO - 551

1. (a) Why is scalability important for Distributed Systems and how is it achieved? [10]
   (b) Compare and contrast distributed and parallel systems [10]

2 (a) What is Total Ordered Multicast in Distributed Systems ? How can it be achieved using Lamport Clocks? Is there any alternative mechanism also? [20]

3 (a) Explain Distributed Mutual Exclusion with an example. [10]
   (b) What is the importance of election in distributed systems? Discuss two election algorithms that can be used for wired distributed systems [10]

4(a) What is the significance of replication in distributed systems and what are the different mechanisms for placing replicas? [10]
(b) Compare and contract Sequential and Casual consistency data centric consistency models. [10]

5(a) What are primary-based local write consistency protocols? [10]
(b) Explain Quorum based consistency protocols. [10]

Total no. of Pages: 02 *Roll no:.....*

End Semester Examination **Nov-2019**

Third Semester **M.Tech.PT (CSE)**

Paper Code: CO-552 Computer Networks

Duration: 3 Hrs. **Max Marks: 100**

NOTE: *Attempt all the questions. Assume the missing data, if any.*

Q1. Answer the following questions in brief: **(10*2=20)**

a) What are two reasons for using layered protocols?
b) What is the main difference between TCP and UDP?
c) List any two functions of session layer.
d) Differentiate between repeater and hub.
e) Describe the various types of network topologies.
f) A noiseless 8 kHz channel is sampled every 1 ms. What is the maximum data rate?
g) What is the remainder obtained by dividing x^7+x^5+1 by the generator polynomial x^3+1?
h) What is the channel allocation problem?
i) What is optimality principle?
j) What is IPv6?

Q2. a) Explain the distance vector routing, the problem associated with it and how the problem can be solved. **(10)**

b) Give the comparative study of various physical medium used in networks. **(10)**

Q3. a) Describe the various data link layer protocols with suitable diagrams. **(10)**

b) Differentiate between: **(2*5=10)**

(i) ARP and RARP

(ii) Virtual circuit and datagram network.

P.T.O.

Q4. a) Define the role of a firewall and draw a diagram that shows where a firewall should be positioned with relation to protecting a local network. In defining the role of a firewall, you should discuss the techniques that a firewall uses at different levels to prevent external attacks on the network and control traffic flow through the firewall. **(8)**

b) What are the benefits of remote access VPNs? **(6)**

c) What are the problems associated with exchange of public keys? **(6)**

Q5.Explain the following terms (*any five*): **(5*4=20)**

a) CSMA
b) Congestion control
c) IEEE 802.3
d) HTTP
e) SSL
f) Network Simulator

END

Total No. of Pages 02 Roll No.....

5th SEMESTER M.Tech.

END SEMESTER EXAMINATION *May/June-2019*

PAPER CODE: CO-7013 Natural Language Processing

Time: 3:00 Hours *Max. Marks: 50*

Note: Answer five questions. Question No. 1 is compulsory. Assume suitable missing data, if any.

Q.1 Answer all the following questions: [10]

[a] Explain anaphoric ambiguity with example.

[b] Discuss WordNet.

[c] What are NLU and NLG.

[d] How many trigrams phrases can be generated from the following sentence? "#Analytics-vidhya is a great source to learn @data_science."

[e] Discuss Tf-idf and challenges in Tf-Idf.

Q.2[a] Analyze the significance of Word Sense Disambiguation in NLP. Explain any one WSD method [5]

[b] Consider the following four documents (each document is just one sentence).

1. Kitty is a cat.
2. Kitty sat and ate a rat.
3. Rats eat cheese.
4. A rat is sitting.

(a) If we do a morphological analysis of the words in the documents which words will have a morphological break-up and what is it?

(b) What will be the part-of-speech tags for each word in each document? Clearly indicate your PoS tag set.

(c) What will be the content of each document after "stop" word removal?

(d) What will be the content of each document after "stemming" each word in the document after stop word removal? [5]

Q.3[a] Discuss various machine translation techniques. [5]

[b] Explain corpus based semantic similarity measures. [5]

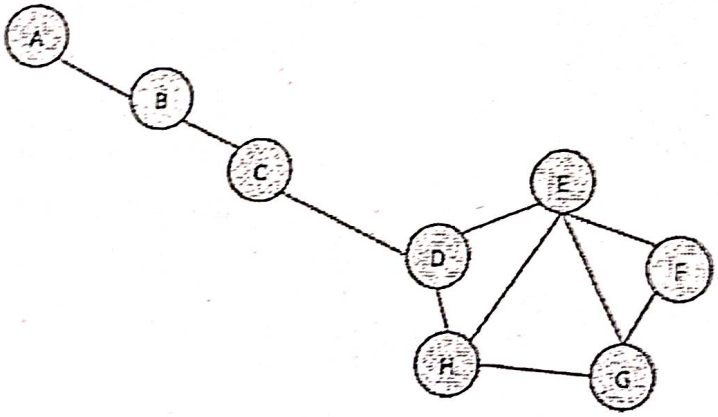
Q.4[a] What is Sentiment analysis. Discuss the challenges in sentiment analysis. [5]

[b] What is cosine similarity? Calculate the cosine similarity between sentence "sam loves me more than linda " and "jane likes me more than sam loves me" [5]

Q.5[a] Explain Query expansion and discuss an approach to perform query expansion with illustration. [10]

Q.6[a] What are dependency parsers ? [5]

[b] Calculate the betweenness centrality for vertex E of graph shown in figure (assume weight of each edge equal to one) [5]



Total No. of Pages: 02 *Roll No. ... .*

III ***Semester*** **M. Tech. (CSE)**

End Semester Examination *(Nov-Dec-2019)*

CO-7022: ADVANCES IN INTERNET & WEB TECHNOLOGY

Time: 3 hrs *Max. Marks: 100*

Note: *Question No. 1 is compulsory. Answer any 4 from the rest. Assume suitable missing data if any.*

Q1.Answer the following: - (4x5=20)

a) Resource Description Framework (RDF)

b) RTT for a non- persistent HTTP

c) Social Web

d) In JavaScript, which symbol is used for comments and what would be the result of 3+2+"7"?

e) Web Content Mining

Q2. a) How is an index created in a typical Web IR system? Represent diagrammatically & elaborate the steps involved in the process. (10)

b) Describe the journey of Web from Web of Documents to the intermittent Web of People to the current Web of Data. (10)

(5x2=10)

Q3. a) Differentiate between the following:

i. Ordered List & Unordered list in HTML

ii. Precision and Recall

iii. Set Theoretic IR Model & Probabilistic IR Model

iv. Client Server architecture and Peer to peer architecture

v. Cookies and Session variable

b) Describe the HTTP Connection Types and their effects on the round trip times for communication between the client-server machines. (10)

Q4. a) How are the concepts of IP addressing, URL & DNS associated? (10)

b) A web page contains 4 images, 1 applet, and 3 images embedded within the applet. How many RTTs does it take to download all objects in the web page? (5)

c) Imagine that the classifier made a total of 165 predictions (e.g., 165 documents were being tested for the presence of a particular term). Out of those 165 cases, the classifier predicted "yes" 110 times, and "no" 55 times. In reality, 105 documents in the sample have the term, and 60 documents do not. Discuss the performance of classifier the basis of Precision, recall and F1 score measures. (5)

Q5. a) Explain the ranking mechanism used by Google search engine. (10)

b) What is the difference between inline, embedded and external style sheets? Explain with examples. (10)

Q6. a) What is the multi-faceted concept of "Context"? Describe the techniques that have been defined in research for Contextual Information Retrieval on the Web. (10)

OR

a) Explain the working of timers in JavaScript? Also elucidate the drawbacks of using the timer, if any? (10)

b) Explain any four applications of sentiment analysis. (10)

-END-

Total No. of Pages 02 Roll No.....

5th SEMESTER M.Tech.

END SEMESTER EXAMINATION *May/June-2019*

PAPER CODE: CO-7124 Natural Language Processing

Time: 3:00 Hours *Max. Marks: 50*

Note: Answer five questions. Question No. 1 is compulsory. Assume suitable missing data, if any.

Q.1 Answer all the following questions: [10]

[a] Discuss Tf-idf and challenges in Tf-Idf.

[b] Discuss WordNet.

[c] What are NLU and NLG.

[d] How many trigrams phrases can be generated from the following sentence? "#Analytics-vidhya is a great source to learn @data_science."

[e] Explain anaphoric ambiguity with example.

Q.2[a] Analyze the significance of Word Sense Disambiguation in NLP. Explain any one WSD method [5]

[b] Consider the following four documents (each document is just one sentence).

1. Kitty is a cat.
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(b) What will be the part-of-speech tags for each word in each document? Clearly indicate your PoS tag set.

P.T.O.

(c) What will be the content of each document after "stop" word removal?

(d) What will be the content of each document after "stemming" each word in the document after stop word removal? [5]

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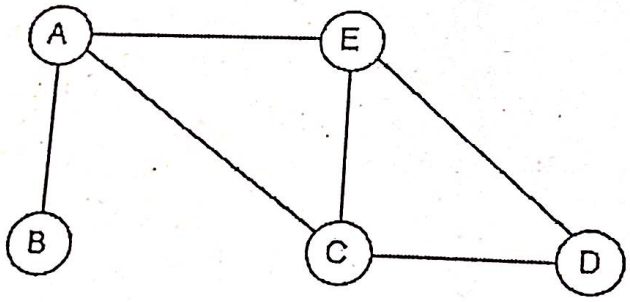
Q.6[a] What are dependency parsers ? [5]

[b] Calculate the betweenness centrality for vertex E of graph shown in figure (assume weight of each edge equal to one) [5]



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Total No. of Pages 03

Roll No. .....

M.Tech.[C&I]

FIRST SEMESTER

END SEMESTER EXAMINATION Nov/Dec *2019*

C&I 501 System Theory

Time: 3:00 Hours *Max. Marks :40*

Note: Attempt any five questions. Assume suitable missing data, if any.

1 [a] Obtain the state space (State Model) representation for the mechanical system shown in figure 1. (4)

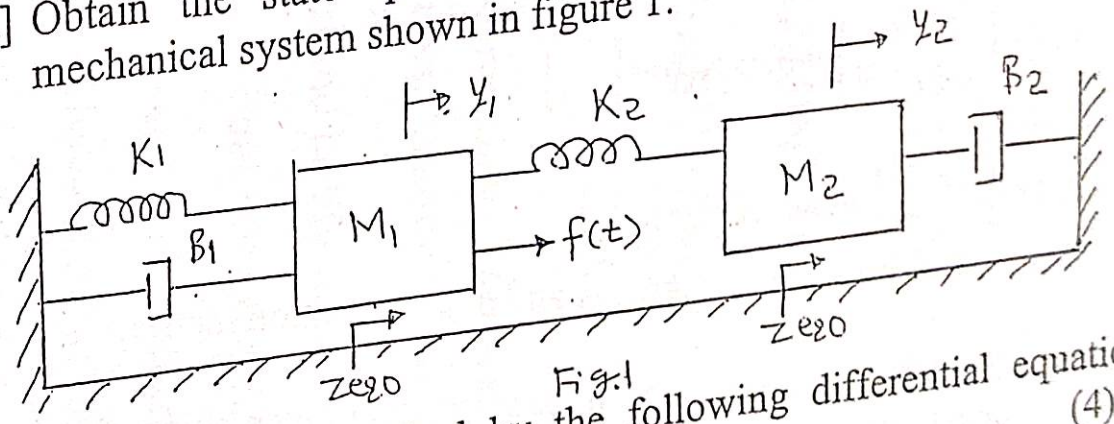


Fig.1

1 [b] A system is described by the following differential equation. Represent the system in phase variable form: (4)

$$\frac{d^3x(t)}{dt^3} + 3\frac{d^2x(t)}{dt^2} + 4\frac{dx(t)}{dt} + 4x(t) = u_1(t) + 4u_2(t) + 6u_3(t)$$

Outputs are

$$y_1(t) = 4\frac{dx(t)}{dt} + 3u_1(t)$$

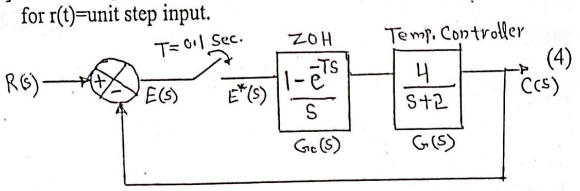
$$y_2(t) = \frac{d^2x(t)}{dt^2} + 4u_2(t) + u_3(t)$$

2 [a] Solve the difference equation (4)

$$c(k+2) + 3c(k+1) + 2c(k) = u(k);\ c(0) = 1$$

$$c(k) = 0\ for\ k < 0.$$

2 [b] For the sampled-data control system shown in Fig.2, find output c(k) for r(t)=unit step input.



(4)

Fig: 2

3 [a] For a system represented by the state equation (4)
$\dot{X}(t)=AX(t)$

the response of

$X(t)=\begin{bmatrix} e^{-2t} \\ -2e^{-2t} \end{bmatrix}$ when $X(0)=\begin{bmatrix} 1 \\ -2 \end{bmatrix}$

And

$X(t)=\begin{bmatrix} e^{-t} \\ -e^{-t} \end{bmatrix}$ when $X(0)=\begin{bmatrix} 1 \\ -1 \end{bmatrix}$

Determine the system matrix A and state transition matrix.

3[b] Find the transfer function from the data given below for continuous system. (4)

$$A=\begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix}, B=\begin{bmatrix} 1 \\ 1 \end{bmatrix}, C=[1 \quad 1], D=0$$

4 [a] Discuss the advantages of modern control theory over the classical control theory. (4)

4 [b] Find the z transform of the output for the LDS described by
$c(k+2)+6c(k+1)+5c(k)=4r(k+2)+3r(k+1)+2r(k)$. (4)

5[a] Check the stability of the following characteristic equation using Jury's stability test. (4)

$$5Z^2-2Z+2=0$$

5[b] Consider the dynamics of a non-homogeneous system as (4)

$$\begin{bmatrix} \dot{x}_1(t) \\ \dot{x}_2(t) \end{bmatrix}=\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix}+\begin{bmatrix} 0 \\ 1 \end{bmatrix}u(t)$$

where u(t) is the unit step function occurring at $t=0$.

$$y(t)=[1 \quad 0]X(t)$$

and the initial condition $X(0)=[1 \quad 0]^T$

Determine the solution of state equation using Laplace inverse transform technique.

6[a]. Obtain the STM of the following system

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix}=\begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}\begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}$$ (4)

6[b]. Determine the stability of the following characteristic equation using Bilinear Transformation. (4)

$$Z^3-0.2Z^2-0.25Z+0.05=0$$

7 A discrete time system is described by state equation (2×4)

$$y(k+2)+5y(k+1)+6y(k)=u(k)$$
$$y(0)=y(1)=0; T=1\ sec.$$

(a) Determine the state model in canonical form
(b) Find state transition matrix
(c) Determine the state model in phase variable form
(d) For input u(k)=1 for k≥0, find output y(k).

Total No. of Pages 2 Roll No .----------

FIRST SEMESTER M.Tech.(C&I)

END SEMESTER EXAMINATION NOV/DEC 2019

C&I-503 MEASUREMENT AND INSTRUMENTATION

Time: 3 Hours **Max. Marks: 40**

Note: Question No. 1 is compulsory. Answer any FOUR questions from remaining. All questions carry equal marks. Assume suitable missing data if any.

1. Write true or false and justify your answer: (2x4)
   (a) Residual voltage does not exist in LVDT.
   (b) Hay's bridge is used for measurement of low Q coils.
   (c) Low resistances have two terminals.
   (d) For 32 Transmitters & 32 receivers, RS-422 interface can be used.
2. (a) Explain various types of external interference signals and their elimination. (5)
   (b) The solution for the unknown resistance for a Wheatstone bridge is : (3)

$$R_x = \frac{R_2 R_3}{R_1}$$

   Where $R_1 = 100\ \Omega \pm 0.5\%$, $R_2 = 100\ \Omega \pm 1\%$ and $R_3 = 842\ \Omega \pm 0.5\%$
   Determine the magnitude of the unknown resistance and the limiting error in percent and in ohm for the unknown resistance R_x.
3. (a) Explain the working principle of electrodynamometer type of instruments. Derive their torque equation also. (4)
   (b) A moving coil voltmeter with a resistance of 20 Ω gives a full scale deflection of 120° when a potential difference of 100 mV is applied across it. The moving coil has dimensions of 30 mm x 25 mm and is wound with 100 turns. The control spring constant is 0.375 X 10^{-6} Nm/deg. Find the flux density in the air gap. Find also the diameter of copper wire of coil winding if 30 percent of instrument resistance is due to coil winding. (4)
4. An inductance of 0.22 H and 20 Ω resistance is measured by comparison with a fixed standard inductance of 0.1 H and 40 Ω resistance. They are connected as shown in Fig. 1. The unknown inductance is in arm ab and the standard inductance is in arm

bc, a resistance of 750 Ω is connected in arm cd and an unknown resistance is in arm da.

Find the resistance of arm da and determine any necessary and practical additions required to achieve both resistive and inductive balance. (8)

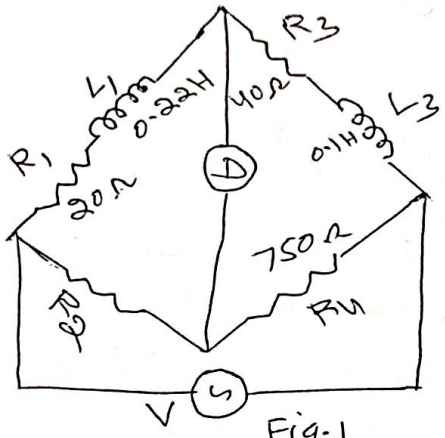


Fig-1

5. Write names of AC bridges to measure inductance. Explain the working principle of AC bridge which is suitable for accurate measurement of dissipation factor of a capacitor. Draw its phasor diagram also. (8)
6. (a) Explain the working principle of metallic strain gauges. Derive the expression for gauge factor also. (5)

   (b) The output of an LVDT is connected to a 10 V voltmeter through an amplifier whose amplification factor is 300. An output of 2 mV appears across the terminals of LVDT when the core moves through a distance of 0.5 mm. calculate the sensitivity of LVDT and that of the whole setup. The mili-voltmeter scale has 100 divisions; the scale can be read to 1/5 of a division. Calculate the resolution of the instrument in mm. (3)
7. (a) Explain basic sampling and storage system for a DSO. (4)

   (b) Explain eight control lines of IEEE-488 Instrumentation Bus (GPIB). (4)

-END-

Total No. of Pages 2 *Roll No. .....*

M.Tech (C&I) *FIRST SEMESTER*

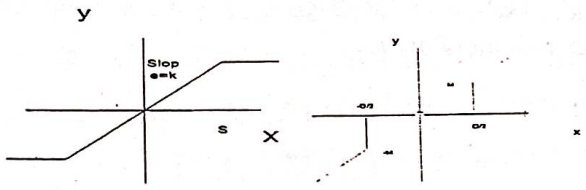
END SEMESTER EXAMINATION *(DEC–2019)*

C&I 5303 NONLINEAR CONTROL THEORY

Time: 3 Hours *Maximum Marks : 50*

Note : Question No.1 is compulsory. Answer **ANY Four** from remaining questions.
Assume suitable missing data, if any.

1[a] Draw the output of the following nonlinear elements, whose input (x) vs output(y) characteristicss are shown in Fig.1. Assume sinusoidal input $x(t) = X\sin t$.



[b] Draw the phase plane trajectory of the 2nd order system described as:

$$\ddot{x} + 4\dot{x} = 2$$

[c] Write the P matrix for following scalar function and find sign of definiteness.

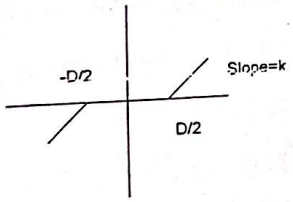
$$V(x) = x_1^2 + 4x_2^2 + 4x_1x_2 + 4x_2x_3 + 2x_1x_3$$

[d] Find the singular point and state the type of singularity in the system described as :

$$\dot{x}_1 = x_2 \quad \dot{x}_2 = -x_1$$

[e] Describe with help of appropriate equation 'Chaos' and bifurcation behavior in nonlinear systems. **2×5**

2[a] For the nonlinear system described by the input output charactristics shown in Fig.2, derive the describing function, where y is output and x is input. **05**



[b] The state space model of a nonlinear system is given by:

$$\dot{x} = y$$

$$\dot{y} = -2x - 3y + y\sin y$$

Write A matrix for the system and determine the symmetric P matrix. Discuss the stability of the system using Lyapunov Direct method. **05**

3 Using Delta method sketch the phase plane trajectory on a linear graph paper and investigate the behavior of the following nonlinear system.

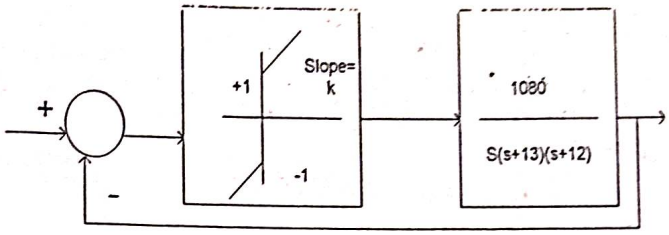
$\ddot{x} + 0.25\,\dot{x} + x + 0.5x^3 = 1$: assuming starting point (2,4). 10

4 Use Variable gradient method to construct a proper Lyapunov function for the nonlinear system described as:

$\dot{x}_1 = -x_2 \;;\; \dot{x}_2 = -x_2 - x_1^3$

Assess the stability of equilibrium state of the system. 10

5 Investigate the possibility of a self-sustained oscillations in the system shown in Fig. below ? If so what would be the frequency and amplitude of oscillations, when k=0.4?Also access the stability of the limit cycle. Derive the describing function for nonlinear element also.



10

6. [a] Determine whether a positive definite symmetry matrix P exist to the Lyapunov equation for the LTI system described by.

$$\dot{x} = \begin{matrix} 0 & 1 \\ -1 & -1 \end{matrix} x$$

And determine stability of the system using Lyapunov direct method. 5

[b] Using Krasovskii method access the stability of a nonlinear system represented as: 5

$$\dot{x}_1 = -5x_1 + 4x_2$$
$$\dot{x}_2 = x_1 - 2x_2 - x_2^5$$

Total No. of Pages: 1

M. Tech. (C&I)

Roll No.....

END SEMESTER EXAMINATION

FIRST SEMESTER

(Nov-Dec 2019)

C&I-5407 SOFT COMPUTING TECHNIQUES

Time: 3:00 Hrs **Max. Marks: 100**

Q1. Answer all the following questions.

a. What is Genetic Programming? Explain (5)

b. Write in detail about various operators in Genetic Algorithm. (5)

c. Apply Genetic Algorithm to maximize the function f(x) = x2, where x is permitted to vary between 0 and 29. Mention all the steps. (10)

Q2. Answer all the following questions.

a. Write pseudo code of a simple Genetic Algorithm (GA). (5)

b. What is Encoding in GA? Explain different types of encoding? (5)

c. Explain following basic terminologies used in Genetic Algorithm. (i) Individuals (ii) Genes (iii) Fitness (iv) populations (10)

Q3. Answer all the following questions.

a. Write about advantages and limitations of GA. (5)

b. What is the advantage of Hybrid network? List any three hybrid systems. (5)

c. Explain in detail the ANN-Fuzzy and ANN-GA Hybrid networks with block diagrams. (10)

Q4. Answer all the following questions.

a. Explain the role of Inference Engine in Fuzzy system. (5)

b. What is membership function? Explain its features ant types. (5)

c. What is fuzzy Set? Consider two given fuzzy sets, perform union, intersection, difference and complement over fuzzy sets A and B.

$\tilde{A} = \{\frac{1}{2} + \frac{0.3}{4} + \frac{0.5}{6} + \frac{0.2}{8}\}$, $\tilde{B} = \{\frac{0.5}{2} + \frac{0.4}{4} + \frac{0.1}{6} + \frac{1}{8}\}$

Also Prove De Morgon's law on fuzzy sets A and B. (10)

Q5. Write short notes on followings. (20)

a. Price Forecasting **b.** RBFN **c.** Perceptron **d.** Gradient Descent

Total No. of Pages 2 *Roll No. .....*

M.Tech. III SEMESTER(C&I)FT/ V SEMESTER(C&I) PT/Ph.D
END SEMESTER EXAMINATION *(Nov.–Dec.–2019)*
EE-7122 ADVANCED CONTROL SYSTEM DESIGN
Time: 3:00Hours ***Maximum Marks : 100***

Note : Answer any FIVE questions.
Assume suitable missing data, if any.

1[a] Prove that in dead beat control, any non zero error vector will be driven to origin in at most n sampling period if magnitude of scalar control u(k) is unbounded. **10**

[b] Discuss a more general approach to determine the observer feedback gain matrix K. **10**

2[a] Consider the system defined by

$$x(k+1)=\begin{vmatrix} 0 & 2 \\ -0.2 & -3 \end{vmatrix} x(k)+\begin{vmatrix} 0 \\ 1 \end{vmatrix} u(k)$$

$$y(k)=|1\ 0|\, x(k) \quad \text{and} \quad u(k)= K_0 r(k)-Kx(k)$$

Design a state feedback control system with refrence input such that desired characteristic equation are at $z=0.5\pm j0.5$ **10**

[b] The Dynamics of the system is

$X(k+1) = GX(k) + H\,U(k)$ and output is $Y(k) = C\,X(k)$

Where $G = \begin{vmatrix} -1 & 0 & 1 \\ 1 & -2 & 0 \\ 0 & 0 & -3 \end{vmatrix}$ $H = \begin{vmatrix} 0 \\ 1 \\ 1 \end{vmatrix}$

$C = [1 \quad 1 \quad 1]$

Transform the system in to OCF. Design a state observer for this system to find observer feedback gain matrix Ke, such that desired closed loop poles are at $z = -2 \pm j2\sqrt{3}$ and $z = -10$. **10**

3 The approximate difference equation representation for a continuous operating system is $x(k+1)=x(k)+u(k)$; $k=0,1$ where $u(0)$ and $u(1)$ are to be selected to minimize the performance measure $J=x^2(2)+2u^2(0)+2u^2(1)$ subjected to constraints

$0.0\le x(k)\le 1.5$; $k=0,1,2$

And $-1.0\le u(k)\le 1.0$; $k=0,1$

Quantize the state values in to the step of 0.5 and control input values in to the step of 0.25. Find the optimal control values and minimum cost for each point on the state grid. Use linear interpolation. **20**

P.T.O

4[a] By considering linear quadratic regulator problem derive expression for Algebraic Riccati Equation. 10

[b] Consider the system

$\dot{x}_1 = x_2 + u_1$

$\dot{x}_2 = u_2$

Find the optimal control u^* for the functional using Hamilton Jacobi method.

$$J=\frac{1}{2}\int_0^4 (u_1^2 + u_2^2)dt$$

given $x_1(0)= x_2(0) = 1$ and $x_1(4)= x_2(4) = 0$ 10

5[a] Explain the formulation of variational calculus using Hamiltonian method, hence derive state, co-state and control equation. 10

[b] Find the extremal of the functional

$$J(x)=\int_0^{\pi/4} (x_1^2+\dot{x}_2^2 + \dot{x}_1\dot{x}_2)dt$$

The boundary conditions are $x_1(0)=0$, $x_1(\frac{\pi}{4})=1$, $x_2(0)=0$, $x_2(\frac{\pi}{4})= -1$ 10

6[a] Derive the expression for feedback gains of a sliding mode controller so that the closed loop system is stable to the sliding surface. 10

[b] Consider the following model of dynamical system

$\dot{x} = 2u_1 + 2u_2$; $x(0) = 3$; which is to be controlled to minimise the performance index

$$J=\int_0^{\infty} (x^2 + 4u_1^2 + 4u_2^2)dt$$

Find (i) the solution to the ARE corresponding to the linear state Feedback optimal controller.

(ii) the optimal control law

(iii) the value of performance index J for the optimal closed loop system. 10

7 Write short notes on following: 10,10

[a] Pontryagin Minimum Principle

[b] Tuning of PID controller

-END-

—155-A—

Total No. of Pages – 2
M. Tech. C&I
End Term Examination

Roll No. .....
Third Semester
November – 2019

EE-7114 SCADA AND ENERGY MANAGEMENT SYSTEM

Time: 3:00 Hours

Max. Marks: 100

Note: Question ONE is compulsory. Attempt any FOUR from the remaining questions. Assume suitable missing data, if any.

1. (a) Explain the various components of a SCADA system with the help of a suitable diagram. Describe the different types of processes that can benefit from SCADA. [3]

   (b) Real time is relative. For the following process concerns, determine if the response time is adequate. Justify your answer in each case. [3]

   i) Customer billing for gas through a meter is issued once per month. The scan rate is once per hour.

   ii) Customer billing for fuel in a filling station is based on individual fill-ups, each lasting ninety seconds. The scan rate of the meter is once per hour.

   iii) Two meters measuring gas into and out of a pipeline are scanned every ten minutes. An alarm is generated if the sum of the last four inlet measurements exceeds the sum of the last four outlet measurements.

   (c) What is a cyclic redundancy code (CRC) used for? Is it calculated by the MTU or the RTU? Explain, if it is possible to transmit more than 1200 bps on a 1200-baud modem. [3]

   (d) Explain the factors which affects the scan cycle at MTU? [3]

   (e) In what way does the MTU treat an alarm point differently than it treats a status point? What is the purpose of an alarm log? [3]

   (f) Explain the Ethernet IEEE 802.3 Standard [3]

   (g) What is meant by "reporting by exception"? [2]

2. (a) Describe the Internet model used for Data Communication. [10]

   (b) Explain with the help of suitable diagram fiber optic as a transmission medium in SCADA [10]

3. (a) With the help of a suitable diagram, explain the various components of RTU and the functions performed by them? [10]

   (b) Explain how an analog signal is developed to represent a 50% opening of a valve position with suitable diagram. [10]

4. (a) Explain the concept of configuring a process picture at MTU using the example of an oil pipeline under control of a SCADA system [10]

   (b) How does the MTU detect an oil leakage in the above oil pipeline system, if three RTUs along with associated field devices are used for monitoring and control of the pipeline [10]

5. (a) Describe the operational aspects that directly influence the Control Centre of a Power System in achieving its objectives.
   (b) Briefly explain the DNP3 protocol used in a typical SCADA system

6. (a) Elaborate the important function of EMS.
   (b) Discuss the various hierarchical levels of Production Control along with their objectives

7. Write short notes on any two of the following: -
   (a) Current Transformer and Potential Transformer
   (b) Modbus Protocol
   (c) Programmable Logic Controller

Total No. of Pages *Roll No. .....*

FIRST SEMESTER **M.TECH. (POWER SYSTEM)**

END SEMESTER EXAMINATION **Nov/Dec-2019**

PSY-501 Advance Power System Analysis

Time: 3:00 Hours ***Max. Marks : 40***

Note : Answer any *FIVE* questions.
Assume suitable missing data, if any.

Q.1 a. For a given 3-bus system, the various line impedances are given as:
$z_{13} = j0.1$, $z_{12} = j0.1$, $z_{23} = j0.1$
Determine the second column of the Z_{bus} matrix using L U decomposition. 4

b. Explain the factors responsible of heat generation and heat dissipation in TL conductors. Give the complete heat balance equation. 4

Q.2 For a given 3 bus system, the various line and bus data are given below:
Line data: $y_{12} = y_{13} = y_{23} = -j4$
Bus Data: Bus 1 : slack bus, $V = 1.06 + j0$
Bus 2 : PV Bus, V(mag) = 1.0pu, $P_G = 3$pu
Bus 3 : PQ Bus, $P_D = 3$pu, $Q_D = 2.5$pu
Carry out one iteration of load flow solution using FDLF method. Take Q limits of generator bus as $0.1\text{pu} \leq Q \leq 0.2$ pu. 8

Q.3 a. Explain Modal Theory for wave propagation and give the significance of various modes of propagation. 4
b. Explain how the 3 – phase quantities can be converted from three-phase (a-b-c) reference frame to d-q-0 reference frame. 4

Q.4 A 25 MVA, 11kV, three phase generator has a sub-transient reactance of 20%. The generator supplies two motors over a TL with transformers at both the ends. The motors have rated inputs of 15 and 7.5 MVA, both at 10kV with 25% sub-transient reactance. The three phase transformers are both rated 30 MVA, 10.8/121 kV, connection delta/star with leakage reactance of 10% each. The series reactance of the TL is 100 ohms. Assume that the negative sequence reactance of each machine is equal to its positive sequence reactance. Assume zero sequence reactance for the generator and motors as 0.06 pu. Current limiting reactors of 2.5 ohms each are connected in the neutral of generator and smaller motor. The transformers neutrals are solidly grounded. The zero sequence reactance of TL is 300 ohms. Draw the positive, negative and zero sequence reactance diagram of the system. 8

Q.5 a. Explain the various approximations made in FDLF LFA. 4
b. Explain how the presence of regulating transformer between two buses, modifies the formation of Y_{bus} matrix. 4

Q.6 a. Consider a 3-phase, 400 kV, vertical configuration line. Height of top conductor is 45 m above ground and distance between conductors is 9.0 m. The conductors are 2x3.18 cm dia. and B = 45.72 cm. Calculate capacitance matrix per km for un-transposed and completely transposed line configuration. 4

b. Explain Equal Area Criteria for determining the stability of a system. 4

Q.7 Write short notes on any **TWO** **2x4=8**

i. Economic load dispatch considering system losses
ii. Algorithm of N-R method for LFA
iii. Algorithm for determination of symmetrical short circuit fault

Total Number of Pages 2

M.Tech Power Systems Roll No.....

END SEMESTER EXAMINATION *1st SEMESTER*

PSY-503 **Advanced Power Electronics** *(Nov-2019)*

Time: 3 Hours ***Maximum Marks:40***

Note: Assume suitable missing data, if any
Q.1, Q2 and Q3 are compulsory. Attempt any other 3 from the rest
Attempt all parts of a question at one place (Marks may not be awarded otherwise)

1 Giving reasons by explaining (*very briefly*), why?

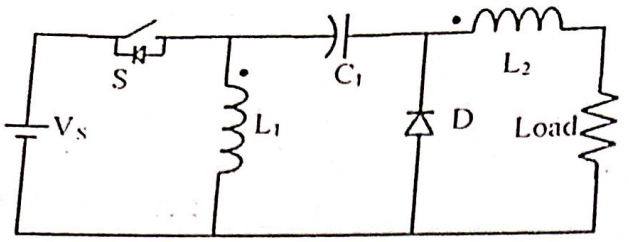
(i) For push pull converter duty cycle is generally kept lower than 0.5.
(ii) Only even harmonics exits on the DC side of AC-DC converters.
(iii) Cúk converter is preferred over Buck-Boost for higher efficiency.
(iv) Load voltage profile of 3 phase inverter operating with single pulse (180° conduction) do not contain 3rd harmonics and their multiples, when feeding to 3 phase Y connected load without neutral.
(v) RMS value of SPWM inverter scheme is lower than square wave despite of the fact that SPWM inverters are preferred over square inverters.
(vi) DC bus voltage of grid connected inverters is always kept higher than the maximum grid voltage (line-line).
(vii) Current controlled Voltage Source Inverter(VSI) offer fast & flexible control and grid coupling, vis-à-vis voltage controlled VSI.
(viii) Multilevel inverters offer higher voltage coupled with reduced voltage harmonics. **1x8**

2 [a] An office complex is supplied with a three-phase four-wire distribution system with a line voltage of 415V at 50 Hz. The three phases of the balanced supply are connected to perfectly balance single-phase rectifier loads (connected between phases and neutral terminal). The loads are highly non-linear with very high concentration of lower order harmonics *(3rd 54%; 5th 32%; 7th 18% of the fundamental; others are negligible being less than 10%)*. If the load in each phase is perfectly balanced, and current in each phase is 20A(rms), determine the fundamental rms phase current and rms current in the neutral. **3**

[b] The full-wave rectifier having capacitor filter feeding a resistive load (500Ω) has a 230V source at 50 Hz. Determine the value of capacitance that would reduce the output voltage ripple to 1% of the dc value. **2**

[c] Quantify the effect of source impedance on the output of single phase diode bridge rectifier. Derive the expression from the fundamentals. **3**

3 [a] Derive the relationship between input and output voltages for the ZETA converter using the average voltage across shunt inductor(L_1). Also derive the minimum value of inductor L_1, in addition to the value of C_1 in terms of the ratios of their ripple voltages and output voltage. **3**



[b] Through block diagram, using instantaneous power theory, compute the reference signals for control of VSI for compensation of harmonics and reactive power.

[c] Derive the expression form the fundamental for the R & C parameters of a RCD turn-off snubber. Design a turn-off RCD snubber for a transistor switch operating at 100kHz with a duty ratio of 40% and transistor turn-off time of 0.1μs. Operating voltage is 150V and load current is 10A. Use criterion that switch voltage reaches V_s, when switch current reaches zero. 3

4 [a]Draw a neat set of waveforms of 3 phase inverter output, line voltage and load voltage, when feeding a 3phase 3 wire, Y connected load with 120° conduction. Obtain their equations from the fundamentals using fourier analysis.

[b] Derive the equation for output voltage using fourier series for 5level cascaded H bridge multilevel inverter operating with single pulse per half cycle by each bridge. For what values of α_1 and α_2, the output will not have 3^{rd} harmonics. 4

5 [a] A single-phase, full-wave converter is feeding to the load consisting of R=10Ω and L=50 mH. The ideal 50Hz sinusoidal supply is depicted as $340\sin\omega t$. Calculate values for the average and rms load currents, the power dissipation and the power factor at the supply terminals if the thyristor firing angle is 45°, considering domination of 2^{nd} harmonic on the load voltage waveform. 4

[b] Derive the equation for current drawn by a 12 pulse converter by adding the currents of two 3 phase (*30° phase displaced*) pulse converters using fourier series. Show clearly that all triplens and harmonics except 12n±1 vanishes. 4

6 .[a]Draw A push-pull converter has the following parameters:
Vs=30V, N_P/N_S=2, D=0.3, L_x=0.5mH, R=6Ω, C=50μF, f=10 kHz
Determine V_o (Output Voltage), the maximum and minimum values of filter inductor current (i_{Lx}), and the output ripple voltage through analysis. Assume all components are ideal. 4

[b] Design a Cúk converter that has an input of 25V and an output of 30V. The load is 60 W. Specify the duty ratio, switching frequency, inductor values, and capacitor values. The maximum change in inductor currents must be 20% of the average currents. The ripple voltage across storage capacitor C_1 must be less than 5%, and the output ripple voltage must be less than 1%. 4

Total No. of Pages :03

Roll No.....

I SEMESTER

M.Tech. [PSY]

END SEMESTER EXAMINATION

Nov/Dec-2019

PSY ~~EE~~ 5303: FLEXIBLE AC TRANSMISSION SYSTEMS

Time: 3:00 Hours

Max. Marks : 50

Note : Answer any five.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] Briefly explain, with neat diagrams, how to minimise harmonics occurring due to SVC in power systems. 4

[b] A TCSC is connected in series with a transmission line between two buses '1' and '2'. The transmission line reactance is 0.2 p.u. The TCSC parameters are: X_L=0.005 p.u, X_C=0.05 p.u. The sending and receiving end bus voltages are $V_1 = 0.99\angle 10^0$ and $V_2 = 0.99\angle 4^0$ p.u. Find the power transfer capability of the line-TCSC combination at a firing angle of (i) 120^0 and (ii) 160^0. 6

Q.2[a]A SSSC is connected in series with a transmission line. The SSSC is installed at the line sending end. Derive an expression for the reactive power exchanged by the SSSC converter with the line in the capacitive mode. 4

[b]A lossless STATCOM is connected to a load bus as shown in the equivalent circuit of Fig. 1.

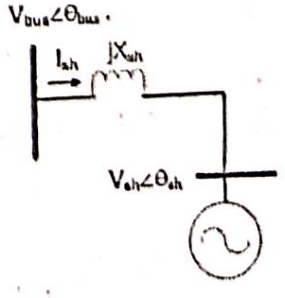


Fig. 1: Equivalent circuit of a STATCOM connected to a load bus

P.T.O

The STATCOM delivers a reactive power of 0.2 p.u. to the bus. The load bus voltage is $V_1 = 0.98\angle 10^0$ p.u while the leakage reactance of the coupling transformer is 0.15 p.u. Compute the STATCOM fundamental output voltage $V_{sh}\angle\theta_{sh}$ and the current magnitude drawn by the STATCOM. 6

Q3. [a] Draw the TCSC reactance vs. firing angle plot. Show on this diagram and explain the different operating modes of the TCSC. 4

[b] A SVC (FC-TCR combination) is connected to a bus whose voltage magnitude is 0.98 p.u. The net SVC currents corresponding to firing angles of 160 and 180 electrical degrees are 0.2 p.u. and 0.25 p.u. Compute the net SVC current at a firing angle of 130 electrical degrees. 6

Q.4[a] Elucidate, with V-I characteristics and P-δ curves, how a STATCOM is better than a SVC. 3

[b] Fig. 2 below shows a lossless UPFC connected at the sending end of a transmission line between buses 1 and 2.

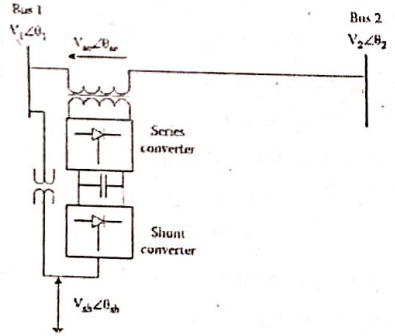


Fig. 2: UPFC connected at sending end of a line

The line reactance is 0.2 pu and the series converter coupling transformer leakage reactance is negligible. The bus voltages at the sending and receiving end are $V_1 = 0.99\angle 10^0$ and $V_2 = 0.99\angle 4^0$ p.u.

P.T.O

(a) If the UPFC transmits 0.8 p.u active power at the receiving end of the line at unity power factor (P_{12RE}=0.8 p.u. and Q_{12RE}=0), find V_{se} and θ_{se}.

(b) If the UPFC shunt converter delivers 0.25 p.u reactive power to the sending end bus, find $\mathbf{V_{sh}}$. Assume shunt coupling transformer leakage reactance as 0.15 p.u. 7

Q.5[a] Explain, with neat diagrams, how a IPFC is better than a SSSC. 4

[b] Draw the three-phase physical connection diagram of a UPFC installed at the receiving end of a transmission line between two buses. 6

Q.6 Write short notes on (any two): 2 x 5

[i] How SSSC is immune to SSR, unlike TCSC

[ii] P-δ characteristics of a line with SSSC

[iii] How direction of instantaneous power is dictated by the conducting elements of a STATCOM.

-END-

Total No. of Pages: 1 *Roll No. .....*

FIRST SEMESTER **M.Tech. (PSY)**

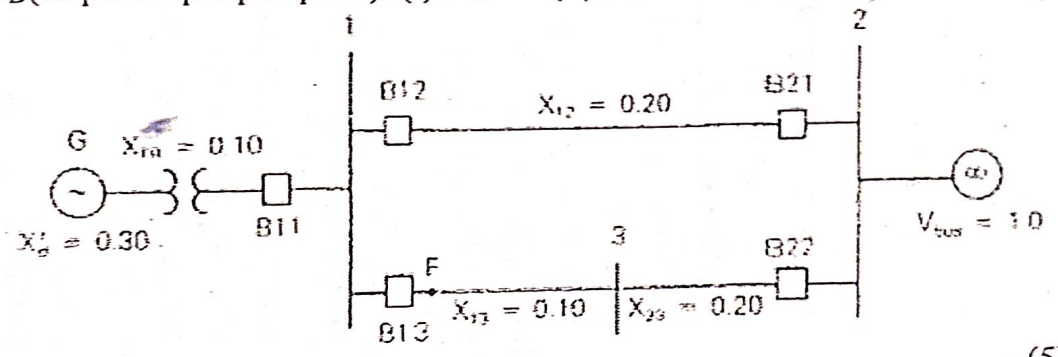
END SEMESTER EXAMINATION *NOV-2019*

PSY 5401 POWER SYSTEM DYNAMICS & STABILITY

Time: 3 Hours *Max. Marks : 40*

Note: Answer all questions. Assume suitable missing data, if any.

1. Figure shows a single-line diagram of a three-phase, 60-Hz synchronous generator with inertia constant H=3.5 MW.sec/MVA, connected through a transformer and parallel transmission lines to an infinite bus. All reactances are given in per-unit on a common system base. Write the linearized state equations of the system. Determine the Eigen values, damped frequency of oscillation in Hz, damping ratio and undamped natural frequency of each of the following values of damping coefficient K_D(in pu torque/pu speed). (i) $K_D = 0$ (ii) $K_D = -10$ (iii) $K_D = 10$



(5)

2. Explain phenomenon of Sub Synchronous resonance in power system (5)
3. Explain the mathematical modelling of governor for (a)hydraulic turbine **OR** (b)steam turbine. (5)
4. Discuss in detail with necessary equations and block diagram of SMIB configuration with the inclusion of PSS and the effect of increasing the phase lead provided by the PSS. (5)
5. (a) Differentiate between steady state and transient stability. **OR** (b).Draw the power system operating states, showing its all possible directions of transitions (5)
6. Explain the equal area criterion for single machine infinite bus system with the help of power angle curves. (5)
7. Explain in detail about the point by point method of solution of transient stability. (5)
8. (a)Obtain computation of $C_p[C_p]^{-1}$ **OR** (b) Derive the swing equation. (5)

Total No. of Pages :03

Roll No.....

M.Tech. [PSY]

III SEMESTER

END SEMESTER EXAMINATION *Nov/Dec-2019*

EE 7011: FLEXIBLE AC TRANSMISSION SYSTEMS

Time: 3:00 Hours

Max. Marks : 100

Note : Answer any five.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] Briefly explain the harmonics occurring in power systems due to SVC installation. Which are the harmonics to be targeted for removal ? Also draw neat diagrams to showcase how to minimise the harmonic effects. 8

[b] A TCSC is connected in series with a transmission line between two buses '1' and '2'. The transmission line reactance is 0.2 p.u. The sending and receiving end bus voltages are $V_1 = 1\angle 10^0$ and $V_2 = 1\angle 4^0$ p.u. The power transfer capability of the line-TCSC combination at a firing angle of 160^0 is 8 p.u. Find the TCSC parameters X_L and X_C. Assume $2 < \sqrt{\frac{X_C}{X_L}} < 4$. 12

Q.2[a] In what way is a IPFC better than a SSSC ? Explain with phasor diagrams. 8

[b] A SSSC is connected at the sending end of a transmission line. The sending and receiving end bus voltages are $V_1 = 0.99\angle 8^0$ and $V_2 = 0.99\angle -2^0$ p.u. The SSSC is operating in the capacitive mode and the magnitude (V_{se}) of the fundamental SSSC output voltage is 0.2 p.u. Determine the (i) magnitude of the current flowing in the transmission line (ii) the reactive power delivered by the series converter and (iii) the reactive power delivered at the receiving end of the line. Assume the transmission line reactance as 0.2 p.u. Neglect SSSC and line losses. 12

P.T.O

Q3. [a] How the STATCOM converter controls (i) the AC side active power and (ii)the AC side reactive power ? Draw neat diagrams to support your answer.8

[b] A lossless STATCOM is connected to a load bus as shown in the equivalent circuit of Fig. 1.

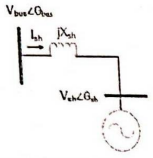


Fig. 1: Equivalent circuit of a STATCOM connected to a load bus

The STATCOM delivers a reactive power of 0.2 p.u. to the bus. The load bus voltage is $V_1 = 0.98\angle 10^0$ p.u while the leakage reactance of the coupling transformer is 0.15 p.u. Compute the (i) STATCOM fundamental output voltage $V_{sh}\angle\theta_{sh}$ (ii) the current magnitude drawn by the STATCOM and (iii) the reactive power entering the bus. **12**

Q.4[a] Derive SSSC P-δ curve and explain why SSSC is better than a TCSC. **8**

[b] Fig. 2 below shows a lossless UPFC connected at the sending end of a transmission line between buses 1 and 2.

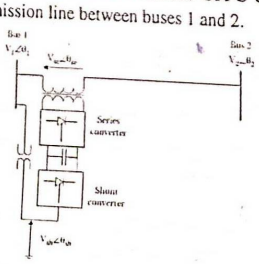


Fig. 2: UPFC connected at sending end of a line

P.T.O

The line reactance is 0.2 pu and the series converter coupling transformer leakage reactance is negligible. The bus voltages at the sending and receiving end are $V_1 = 0.99\angle 10^0$ and $V_2 = 0.99\angle 4^0$ p.u.

(i) If the UPFC transmits 0.8 p.u active power at the receiving end of the line at unity power factor (P_{I2RE}=0.8 p.u. and Q_{I2RE}=0), find V_{se} and θ_{se}.

(ii) If the complex power exchange of the UPFC shunt converter with the sending end bus occurs at 0.85 pf. lag, find $\mathbf{V_{sh}}$. Assume shunt coupling transformer leakage reactance as 0.15 p.u. **12**

Q.5[a] Explain, with neat diagrams, how IPFC is able to simultaneously control the power flow in multiple transmission lines. **8**

[b] Draw the three-phase physical connection diagram of a IPFC installed at the receiving end of a transmission line between two buses. **12**

Q.6 Write short notes on (any two): **2 x 10**

[i] How SSSC is immune to SSR, unlike TCSC

[ii] P-δ characteristics of a line with SVC

[iii] Schematic diagram of a TCR harmonic filter

-End-

Total No. of Pages 2

Roll No. .....

M.Tech./Ph.D (EE) THIRD SEMESTER

END SEMESTER EXAMINATION (Nov–2019)

EE-7022 ADVANCED POWER SYSTEM PROTECTION & SWITCH GEAR

Time: 3:00Hours Maximum Marks : 100

Note : Question 1 is compulsory, answer any 4 from remaining. Assume suitable missing data, if any.

1. **Write true or false and justify the following statements:** (20)

[a] Phase sequence current segregating network with summation devices have their limitations.

[b] The effect of infeed or entry of current from one intermediate section decreases the zone reach of distance relay.

[c] Depending upon the type of faults, the sequence voltages and current are to be constrained leading to a particular choice of relay and relay setting.

[d] Local/remote monitoring facility permit analysis and recording of data pertaining to any sample as well as the state of processor and interphases.

[e] The behavior of CT in deep saturation affects the setting of relay and create complication in the system.

2[a] Prove that a-b distance measuring unit fed with (V_a-V_b) and (I_a-I_b) respond correctly to a-b-g faults as well as a-b-c fault. (10)

[b] How many distance measuring units will be required for a complete three stepped protection of transmission line in case of singly fed system. (10)

3[a] Derive and show the operating characteristics of an over current relay on an R-X plane and explain the draw back of over current relays in the context of distance protection. (10)

[b] Explain the over current relaying applied to various types of distribution system. Draw the typical block diagram for field data acquisition in a distribution system. (10)

4[a] Explain the statement that all numeric relays have the same hardware but what distinguishes the relay is the underlying software? (10)

[b] Explain the conic and quadrilateral characteristics of distance relay. Draw the neat circuit diagram using phase comparators. (10)

5[a] How do you adjust the slope of the simple differential relay and show that the slope of simple differential relay characteristics is zero? (10)

[b] For a three-phase delta-star transformer. show that line to ground fault (External as well as internal) on the star side appears like a line to line fault from the delta side. (10)

6[a] Explain the various equipments required for testing of circuit breaker. Draw the single line diagram showing short-circuit test plant for switch gear testing. (10)

[b] Define the following terms as per IS: (10)

(i) Recovery Voltage
(ii) RRRV
(iii) Duty cycle of circuit breaker
(iv) Percentage dc-offset component at contact separation.

7[a] Differential relaying quite often used when coordination becomes problem. Illustrate in the context of through fault stability of differential relaying. (10)

[b] Enumerate the choice DTOC and IDMT relay based upon Zs/Z_L and draw the relay operating zone characteristics with its schematic diagram. (10)

8[a] "Protection devices co-ordination effects on distributed generators capacity in a radial distribution system". Illustrate the suitable radial feeder and relay characteristics. (10)

[b] Write the usual allocation of relays reclosures and fuses in a typical distribution system. Draw the schematic and sequence of operation. (10)

Total No. of Pages _3__

Roll No..... .....

FIRST SEMESTER

M.Tech

END SEMESTER EXAMINATION *NOV/DEC-2019*

PAPER CODE: MOC501

TITLE OF PAPER: ADVANCE ELECTROMAGNETIC THEORY

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1

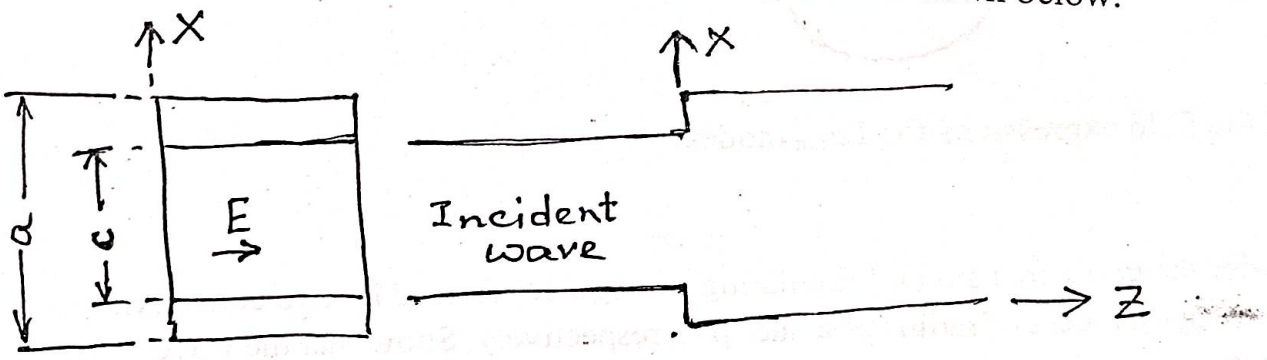
For a parallel plate waveguide formed by conductors covering the y=0 and y=b planes. Show that

$$\psi_n^{TE} = \cos\frac{n\pi y}{b}\, e^{-jk_z z} \qquad n=1,2,3.....$$

are the mode functions generating two dimensional TE_n modes. Find the fields and the wave impedance of the guide.

Q.2

Consider the centered inductive waveguide junction shown below:



assuming that E_y in the aperture is that of the incident mode, show that

susceptance referred to the maximum aperture voltage is given by

$$B_a = \frac{-8\lambda}{\eta\pi^2 b}\left(\frac{c}{a}\right)^2 \Sigma \left[\frac{\cos\left(\frac{m\pi c}{2a}\right)}{1-\left(\frac{mc}{a}\right)^2}\right]^2 \sqrt{\left[\left(\frac{m}{2}\right)^2 - \left(\frac{a}{\lambda}\right)^2\right]}$$

Q.3

(4+4)

(a) Show that for a rectangular waveguide

$$(Z_0)_{mn}{}^{TE}{}_x = \frac{\omega\mu\beta}{k^2-\left(\frac{m\pi}{a}\right)^2} \quad \text{for } f>f_c$$

$$= \frac{-j\omega\mu\alpha}{k^2-\left(\frac{m\pi}{a}\right)^2} \quad \text{for } f<f_c$$

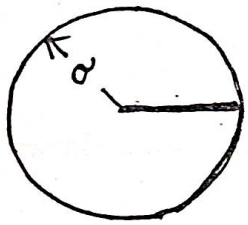
(b) For rectangular cavity resonator, show that TE_{mnp} mode functions are given by $\psi_{mnp}{}^{TE} = \cos\left(\frac{m\pi x}{a}\right)\cos\left(\frac{n\pi y}{b}\right)\sin\left(\frac{p\pi z}{c}\right)$

where m,n=0,1,2..... and p=1,2,3....

Find the resonant fields and resonant frequency for mnp mode.

Q.4

The transverse cross-section of a circular cylindrical waveguide with baffle is shown. Radius of the guide is 'a'.



Find the field expressions for TE_{mn} modes.

Q.5

Consider the two dimensional 'circulating waveguide' formed by two concentric conducting cylinders of radius ρ=a and ρ=b respectively. Show that the wave function

$$\psi = [AJ_n(k\rho) + BN_n(k\rho)]e^{-jn\phi}$$

Specifies circulating modes TM to z, if n is the root of $-\frac{B}{A} = \frac{Jn(ka)}{Nn(ka)} = \frac{Jn(kb)}{Nn(kb)}$

Q6.

Explain the following theorems:

a) Field equivalence theorem

b) Reciprocity theorem

Q7.

For arbitrary shaped cavity the normalized ith resonant fields are given by $\mathbf{E}_i$ and $\mathbf{H}_i$. Cavity is excited by sources $\mathbf{J}$ and $\mathbf{M}$. Express the fields generated within the cavity in terms of resonant mode fields $\mathbf{E}_i$, $\mathbf{H}_i$ and the sources.

Total No. of Pages: 1

~~II (Second)~~ SEMESTER – I

M.Tech. (ECE)

END-TERM EXAMINATION

MOC 503 (Optical Communication Systems)

November, 2019

Time: 3:00 Hours

Max. Marks : 40

NOTE: Answer **ANY 5** Questions. All questions carry equal marks. Assume suitable missing data, if any.

1. A silicon p-i-n photodiode incorporated into an optical receiver has a quantum efficiency of 60% when operating at a wavelength of 0.9 um. The dark current in the device at this operating point is 3nA and the load resistance is 4kΩ. The incident optical power at this wavelength is 200nW and the post detection bandwidth of the receiver is 5MHz. Compare the shot noise generated in the photodiode with the thermal noise in the load resistor at a temperature of 20° C.
2. Explain the working principle of a LASER Diode. Derive an expression for the heat generated in a semiconductor LASER Diode.
3. Elaborate the various noises that influence an optical communication link. Derive the signal to noise ratio for an Avalanche Photodiode.
4. Why are graded index fibers employed in optical communication? A graded index fiber has a core with a parabolic refractive index profile which has a diameter of 50 μm. The fiber has a numerical aperture of 0.2. Estimate the total number of guided modes propagating in the fiber when it is operating at a wavelength of 1 μm.
5. Explain the working of an Erbium Doped Fiber Amplifier with an energy state diagram. How are EDF Amplifiers different from EYDF Amplifiers?
6. Discuss the power and time budget for an optical link, elaborating the various parameters that influence these budgets. Consider an optical system designed to operate on a length of 8 km without repeaters. The rise times of the various components are: source rise time (8 ns), material dispersion broadening (8ns/km), intermodal dispersion broadening (1 ns/km) and detector broadening (6ns). Estimate the maximum bit rate when NRZ and RZ formats are used respectively.
7. Explain the HFC architecture with a suitable diagram. Compare its performance to FTTH.

Total No. of Pages 02

Roll No. .....

FIRST- SEMESTER
END SEMESTER EXAMINATION

M. Tech (MOCE)
November 2019

MOC-5301 RF, MICROWAVE AND MILLIMETER CIRCUITS

TIME: 03 Hrs

Maximum Marks: 40

Note:

1) **Attempt any four questions.**
2) **Assume suitable missing data.**

Q.1

[a] A transmission line has series inductance of 0.56 mH and capacitance of 0.1 μF per km. If the losses due to conductor resistance and insulation leakage are negligible, calculate (i) Characteristic Impedance, (ii) Phase Velocity. (5)

[b] Explain the working of diode as rectification and detection in brief. (5)

Q2 [a] Draw the circuit diagram of single ended mixer and explain its working. (5)

[b] Write short note on impedance and frequency scaling. (5)

Q3[a] What is the significance of Richard's transformation and Kuroda's identities? Explain it. (5)

[b] An N=3 Chabyshev-bandpass filter is to be designed with a 3dB passband ripple for communication link. The centre frequency is at 2.4 GHz and filter must meet the bandwidth requirement of 20%. The Filter must be inserted into a 50Ω characteristics line impedance. Find the inductive and capacitive element. (5)
(g0=g4=1, g1=g3=3.3487, g2 =0.7117)

Q4[a] Determine the condition of oscillator and resonant frequency of Hartley oscillator using common emitter transistor. (7)

[b]. What is the advantages of the transistor oscillator as compare to diode oscillator? (3)

Q5. A BJT connected to a 25Ω source , a 40Ω load impedance Compute the power gain, the available power gain and the transducer power gain if scattering parameters at 1.0 GHz, with a 50 Ω reference impedance: $s11 = 0.38(-158°), s12 = 0.11(54°), s21 = 3.5(80°)$and $s22 = 0.40(-43°)$ (10)

Total No. of pages 1 Roll No.....

THIRD SEMESTER M. Tech.[MOCE]

END SEMESTER EXAMINATION NOV-2019

MOC5401 ADVANCED MICROWAVE DEVICES AND CIRCUITS

Time: 3 Hours Max. Marks: 40

Note: Answer Any FIVE Questions
Assume suitable missing data, if any

1.(a) The characteristic impedance of a uniform transmission line is 2309.6 ohms at a frequency of 800 MHz. At this frequency, the propagation constant is 0.054(0.0366 + j 0.99). Determine Rand L (5)

(b) Explain the reflection on lines not terminated in characteristic impedance with phasor diagrams. Also define reflection coefficient and reflection loss, Quality factor and loaded and unloaded Q (5)

OR

Derive an expression for current and voltage of transmission line terminated with any load impedance and also find the same if the line is short circuited at far end? (10)

2.(a) What are photonic crystrals? Compare EBG and DGS with metamaterials? (5)

(b) How MEMs are fabricated? Described different methods? (5)

3.(a) What are the different biomedical application of MEMs? (5)

(b) Enumerate the design Guidelines for Reliable RF MEMS Switches (5)

4. (a) Draw and explain EMC design flow diagram giving examples to each design (5)

(b) Discuss the steps to prevent emission that causes the EMI in a system (5)

5. Write short notes on any FOUR of the following: (2x5 =10)

(1) Theoretical models of metamaterials
(2) Effects of EMI and its systems
(3) MEM varactors
(4) Tapered transmission lines

Total No. of Pages _2__

Roll No.....

END SEMESTER

M.Tech.

END SEMESTER EXAMINATION *NOV/DEC-2019*

PAPER CODE: EC-7011 TITLE OF PAPER: Antenna Design

Time: 3:00 Hours *Max. Marks: 100*

Note : Answer any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1

A finite length dipole is placed along z axis. The current in the dipole is approximated as

$$I_e\,(x'=0,\ y'=0,z') = a_z I_0 \sin[k(\tfrac{l}{2}-z')] \qquad 0\le z'\le \tfrac{l}{2}$$

$$= a_z I_0 \sin[k((\tfrac{l}{2}+z')] \qquad -\tfrac{l}{2}\le z'\le 0$$

and the antenna produces an electric in the far field region as

$$E_\theta = j\eta(I_0 e^{-jkr}/(2\pi r)[\ \frac{\cos(\frac{kl\cos\theta}{2})-\cos(\frac{kl}{2})}{\sin\theta}\ ]$$

Find the power density, Radiation intensity and radiation resistance of the dipole.

Q.2

For a circular loop antenna of radius 'a' is assumed to be very thin and spatial current distribution is constant (I_0). It is also assumed that the circumference of the loop is also very small. Find the far-field pattern of the antenna.

Q.3

A rectangular aperture (a x b) is mounted on an infinite ground plane. Find the fields radiated by the aperture assuming that over the aperture the electric field is given by

$$E_a = a_y E_0 \cos(\tfrac{\pi x'}{a}) \quad \text{for } -a/2\le x'\le a'/2 \text{ and } -b/2\le y'\le b'/2$$

Q.4

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Show that far fields radiated by sources J_s and M_s in an unbounded region are given by

$$E_\theta = -\frac{jke^{-jkr}}{4\pi r}(L_\Phi + \eta N_\theta)$$

$$E_\Phi = +\frac{jke^{-jkr}}{4\pi r}(L_\theta - \eta N_\Phi)$$

Where $N = \iint J_s e^{jkr'\cos\Psi}\, ds'$ and $L = = \iint M_s e^{jkr'\cos\Psi}\, ds'$

Q.5

(10+10)

a) For an E-plane sectorial horn with aperture dimension a x b_1. If the horn is excited by TE_{10} mode of rectangular waveguide, then what will be the amount of quadratic phase error at the aperture plane? Derive it.

b) Design an E-plane sectorial horn so that the maximum phase deviation at the aperture of the horn is 56.72^0. The dimensions of the horn are $a=0.5\lambda$, b-0.25λ and $b_1=2.75\lambda$.

Q.6

For a rectangular microstrip antenna of dimension W x L fabricated on a copper cladded substrate with permittivity ϵ_r. Find the expressions of TM^z mode fields of the equivalent cavity and find the mode/modes for which the maximum radiations are in the broadside direction.

Q.7

Write notes on any two of the following:

1. Parabolic reflector antenna.
2. Field Equivalence Principle.
3. Near field, far field and reactive near field region of radiation from an antenna.

Total No. of pages 2 Roll No.....

THIRD SEMESTER M. Tech.[MOCE]

END SEMESTER EXAMINATION **NOV/DEC-2019**

EC-7022 OPTICAL SIGNAL PROCESSING

Time: 3 Hours Max. Marks: 100

Note: Answer Any FIVE Questions
Assume suitable missing data, if any

1.(a) Derive an expression for the impulse response of a filter for a band limited signal starting from the basics? (10)

(b) A 5.5 MHz bandwidth baseband video signal onto photographic film using a raster scanned format. If a film resolution is 2.5μ x 2.5μ, equivalent to the spatial sampling interval, calculate the area required to store 25 minutes of information. Assume a square recording format and that the film can support the required 32 information levels at each sample position. Also calculate the highest spatial frequency required of the film and the two-dimensional space bandwidth product of the stored signal and the time bandwidth product of the time signal. (10)

2.(a) State and derive an expression Fermat's principle. (10)

(b) Show that the minimum deviation angle for a thin prism is independent of the angle of incidence (10)

3.(a) Derive an equation for refraction equation for combined surfaces starting from refraction equation of a surface (10)

(b) Derive an expression for optical invariance (10)

4. (a) Derive an expression for the total intensity of a plane wave (10)

(b) A function $f(x) = 1 + \cos(2\pi\alpha_1 x) + \cos(2\pi\alpha_2 x)$ is placed in a Fourier transforming system for which λ=0.5μ, the focal length is F=200mm, and the input aperture is L=50mm. Assume normal incidence illumination and let $\alpha_1 = 15Ab$ and $\alpha_2 = 10Ab$. Suppose that the function is moving with velocity v=4mm/sec in the positive x direction.

(i) Write the general form of $f(x,t)$ that incorporates $f(x)$ and the velocity v.

(ii) Derive the Fourier Transform $F(\alpha, t)$ of $f(x,t)$ in terms of the general variables and parameters (10)

P.T.O

5. (a) State the distinctive features of spatial light modulators? (5)
   (b) Enumerate the features of Fresnel transform (5)
   (c) Explain the terms (5)
      (i) Fresnel Zone
      (ii) Chirp Functions
      (iii) Holograph
   (d) Explain what is principal Pupil Ray (5)

Write short notes on any FOUR of the following: (4x5 =20)

(1) Chirp Z Transform
(2) Space bandwidth product
(3) Fourier transform for non-periodic signals
(4) Blooming and Electrical Crosstalk
(5) Raster format spectrum analyzer
(6) Liquid crystal spatial light modulators

-END-

Total No. of Pages 02 *Roll No. .....*

FIRST- SEMESTER M.TECH(SPDD)
END SEMESTER EXAMINATION NOV-2019

SPD-501 [ADVANCED DIGITAL SIGNAL PROCESSING]

TIME: 03 Hrs Maximum Marks:40

Note: Q.1 is compulsory. Attempt any four questions from remaining five questions. Assume suitable missing data if any.

Q. 1 (a). What is zero padding? State its use. [1x8=8]
(b) What Special addressing mode is used in DSP processor?
(c) What are different quantization methods?
(d) What are the effects of finite word length?
(e) What is multirate signal processing?
(f) What is phase delay and group delay?
(g) State the application of Notch filter and give its transfer function.
(h) What is Gibbs effect? How it can be minimized?

Q.2(a) Find z-transform for $X(n) = e^{-an} \sin \omega n \, u(n)$. [4]
(b) Determine the stability of the filter

$$H(z) = \frac{1 + z^{-1} + z^{-2}}{1 - 1.5z^{-1} + z^{-2} - 0.5z^{-3} + 0.5z^{-4}}$$

by using schor-cohn stability test. [4]

Q.3(a) Realize the FIR filter h(n)=[2,1,2, 0,1] using frequency sampling Method. [4]
(b) Give the parallel form realisation for the IIR filter function

$$H(z) = \frac{1}{(1 + 0.5z^{-1})(1 - 2z^{-1})(1 - 3z^{-1})} \qquad \text{ROC: } |z| > 3$$

[4]

Q.4(a) Discuss the Goertzel Algorith and its application. [4]
(b) Determine the DFT for X(n)=[2 1 0 -1] using DIF-FFT algorithm . [4]

Q.5 (a) What is linear phase digital filter? How it can be designed? [4]

(b) State the implication of bilinear transformation mapping for designing IIR filter and find the digital filter for $H(s) = \frac{3s}{s^2 + 0.5s + 2}$ When T=1. [4]

Q.6 (a) Design an 5th order non-linear phase comb filter and discuss its magnitude spectrum. [4]

(b) Explain frequency domain characteristics of following window function

(i) Blackman window

(ii)Hamming window [4]

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Total No. of Pages: 02 Roll no.....

FIRST SEMESTER M.Tech.(SPE)

END SEMESTER EXAMINATION Nov./Dec.-2019

IMAGE ANALYSIS AND PROCESSING (SPE-503)

Time: 3:00 Hours Max. Marks: 40

Note: Answer all questions. All questions carry equal marks.
Assume suitable missing data.

Q.1 Answer all the questions.

[a] Define Logarithmic transformation. [1.5]

[b] Write down the expression for homomorphic filter function $H(u,v)$ and show the shape of the function. [1.5]

[c] Define Hit-or-Miss Transformation. [1.5]

[d] Write down full forms of BMP, GIF, PDF, PNG, GIFF, and MPEG. [2]

[e] Differentiate Patterns and Pattern Classes. [1.5]

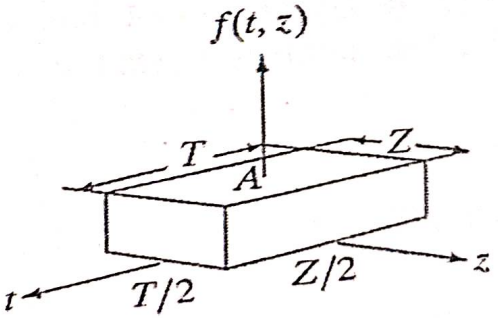
Q.2 Attempt any TWO of the following [4]

[a] Differentiate the following
(i) Spatial and Intensity Resolution
(ii) Pseudocolour and Full Colour Processing

[b] You are given an image with three bits per pixel. Obtain the equalized histogram for the image with the following histogram; [4]

The image has 0,1,2,3,4,5,6, and 7 gray-level values and the corresponding number of pixels are 81,122,245,329,656,850,1023, and 790 respectively. Show both the histograms also.

[c] Determine the Fourier Transform of the following 2-D function. [4]



P.T.O.

Q.4

[a] Define the beta wavelet with all properties of it. Explain the algorithm of the calculation of the orthogonal filters in case of beta wavelet. (5)

[b] What are the different categories of spline wavelets? Explain with advantages and limitations. Explain the procedure of curve shaping using B-splines. (5)

Q.5

[a] What are the Quadrature Mirror Filter (QMF) pair? Explain two channels QMK bank with frequency response of the analysis filters. (5)

[b] What are the different gain parameters used for comparison of wavelet performance? Explain the Binomial QMF Filter Bank. (5)

Q.6

[a] Explain the two channel filter bank design of Reverse Biorthogonal wavelet. (4)

[b] Explain the Hermitian Hat wavelet with properties. How is the Hermitian Hat wavelet used for singularity detection test? (6)

Total No. of Pages 2 *Roll No. .....*

FIRST SEMESTER **M.Tech. (SPDD)**

END SEMESTER EXAMINATION *(November.-2019)*

SPD-5403 ADVANCED DIGITAL SYSTEM DESIGN

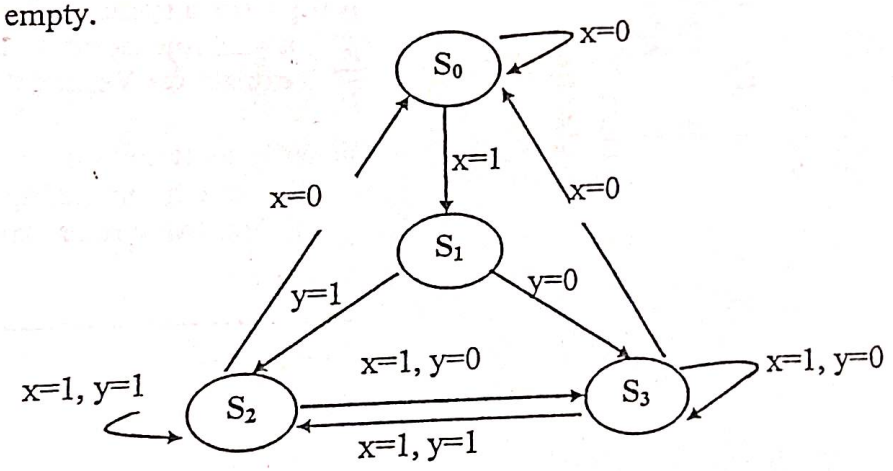
Time: 3 Hour *Max. Marks: 50*

Note: Answer *Any FIVE* questions. All questions carry equal marks
Assume suitable missing data, if any.

Q1[a] Define the term " Redundancy" and how it incorporates fault tolerance in a system? What are the various dependability evaluation techniques? Explain along with numerical representations. 6

[b] Explain Programmable Array Logic (PAL). Design a full adder using a PAL. 4

Q2[a] The state diagram of a control unit is given in Figure 1. It has 4 states and 2 inputs (x,y). Draw the equivalent Algorithmic State Chart, leaving state boxes empty. 3



[b] Design a Mealy machine accepting the language consisting of strings from $\sum^*$, where $\sum = \{a,b\}$ and the strings should end with either aa or bb. 2

[c] Differentiate between the two Procedural assignment groups in Verilog. Explain with a suitable example. 5

Q3[a] Reduce the state machine using Merger Table. Write the compatible pairs. 3

PS	I_1	I_2	I_3
A	E,0	B,-	C,-
B	-,-	D,-	B,0
C	E,-	D,-	C,0
D	C,0	-,-	B,1
E	C,0	-,-	B,-

[b] Design an Algorithmic state chart for a Full adder using the truth table. 3
[c] Explain FPGA along with design flow for implementation of design. 4

Q4[a] For the below mentioned table, perform race-free assignment in asynchronous sequential machine. Draw the race-free transition graph and flow table. 5

State	00	01	11	10
a	a	d	a	c
b	a	b	b	d
c	d	c	b	c
d	d	b	d	a

[b] Differentiate between Fault, Error and Failure with the help of latency diagram. Explain Fault Classification. 5

Q5[a] Define the following terms: 5

i) Fault-tolerance
ii) Fail – stop failure
iii) Fail-fast failure
iv) Fail-soft failure
v) Fail- safe failure

[b] Write a synthesisable Verilog description for a 4-bit BCD counter with asynchronous reset. Follow the programming standards by using comments to explain the Verilog description. 5

Q6 Write short notes on :

i) Verilog - including Levels of abstraction and types of modelling 5
ii) Hardware redundancy 5

Total No. of pages:03

Ist SEMESTER

M.Tech (SPDD-ECE)

Roll No..........

End SEMESTER

NOV/DEC 2019

EC-521 Advanced DSP

Time : 3Hrs

Maximum Marks: 100

Note: Attempt any 10 questions. Assume missing data if any.

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1 a Determine whether the following discrete-time signals are periodic or not. If periodic, determine the fundamental period 6

i. $\sin\frac{2\pi n}{3} + \cos\frac{2\pi n}{5}$

ii. $\cos\left(\frac{\pi}{2} + 0.3n\right)$

iii. $1 + e^{j2\pi n/3} - e^{j4\pi n/7}$

b Prove that the convolution sum operation is commutative and distributive 4

2 a Determine the Fourier Transform of following functions 6

i $x_1[n] = \begin{cases} \alpha^{|n|} & |n| \le M \\ 0 & \text{Otherwise} \end{cases}$

ii $x_2[n] = \alpha^n u[-n-1], |\alpha| > 1$

b For Each of following Descrete-time systems, where y[n] and x[n] are the output and input sequences respectively. Determine whether or not the system is (1) Stable (2) Linear and (3) Time invarient 4

i. $y[n] = n^2 x[n]$

ii. $y[n] = x^4 n$

3 Let g(n) and h(n) be two finite length sequences given below

$\{g(n)\} = \underset{\uparrow}{\{}-3,2,4\}$ $\{h(n)\} = \{2,-4,0,1\}$

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Determine 4

(a)Y_L = g(n) ⊕ h(n)

(b)Extend g(n) to a length- 4 sequence of $g_e(n)$ by zero padding and compute $Y_C(n) = g_e(n) \oplus h(n)\alpha$ 3

(b) The DFT of a real signal is {2,1,_j3, A, 2+j1,0, B, 3, -j5, C}. Find A,B,C 3

4 a The impulse response of a LTI system is h(n) = {1,2,1,-2}. Find response of the system for the input x(n)={1,3,2,1} 4

b Determine the Inverse Fourier Transform of the following 6

i. $H_1(e^{j\omega}) = (2 + 3\cos\omega + 4\cos^2\omega)e^{j\omega/2}$

ii. $H_2(e^{j\omega}) = j(3 + 4\cos\omega + 2\cos^2\omega)\sin\omega$

5 a Let x(n) = {A,2,3,4,5,6,7,B}. If X(0) = 20 and X(4) = 0 find A and B 5

b Consider the length-6 sequence defined for $0 \leq n < 6$. 5

x(n) = {1,-2,3,0,-1,1}

with a 8-point DFT X(k). Evaluate the following functions of X(k) without computing DFT

i. X(0)

ii. X(3)

iii. $\sum_{k=0}^{5} X(K)$

(i) $\sum_{k=0}^{5} |X(k)|^2$

6 a Find all possible inverse Z- Transform of the following function 5

$$X(z) = \frac{Z(z^2 - 4z + 5)}{z^3 - 6z^2 + 11z - 6}$$

b Solve the following difference equation using Z-Transform 5

y(n) + 2 y(n-1) = x(n),

where $x(n) = \left[\frac{1}{3}\right]^n u(n)$ and initial condition y(-1) = 1

7 (a) Show that the 3DB frequency of Low Pass and High pass IIR filter is same. Assume first order LPF and HPF 5

(b) Show that ideal filters are not realizable. How can we improve the characteristics of a simple LPF near to characteristics of ideal filter 5

8 Compute the DFT of the 3-point sequence x(n) = {2,1,2}. Using the same sequence compute 6-point DFT and compare two DFTs 10

9 a Design a LTI High Pass Filter for the following signal X(n) = *Cos* 0.1n + *Cos* 0.4n 5

b Show that the 3DB frequency of Low Pass and High pass IIR filter is same. Assume first order LPF and HPF 5

10 a Define Comb filter and explain its characteristics 5

b Explain different types of Linear Phase Filter 5

11 Determine the fundamental period of following periodic sequences 10

i. $x_1[n] = e^{-j0.4\pi n}$

ii. $x_2[n] = \sin(0.6\pi n + 0.6\pi)$

iii. $x_3[n] = 2\cos(1.1\pi n - 0.5\pi) + 2\sin(0.7\pi n)$

iv. $x_4[n] = 3\sin(1.3\pi n) - 4\cos(0.3\pi n + 0.45\pi)$

$x_5[n] = 5\sin(1.25\pi n + 0.65\pi) + 4\sin(0.8\pi n) - \cos(0.8\pi n)$

12 Plot the pole-zero pattern and determine which of the following system is stable 10

i. y(n) = y(n-1)-0.8y(n-2)+x(n)+x(n-2)

ii. y(n) = 2y(n-1)-0.8y(n-2)+x(n)+0.8x(n-1)

-END-

Total No. of Pages 2 *Roll No. .....*

FIRST SEMESTER **M.Tech.(SPDD)**

END SEMESTER EXAMINATION *(NOVEMBER-2019)*
EC-523 STATISTICAL MATHS AND WAVELET THEORY

Time: 3 Hours *Max. Marks : 100*

Note : Answer *FIVE* questions. Assume suitable missing data, if any.

1 (a) State and prove Plancherel's formula for $l^2(Z)$.
(b) State and prove condition for perfect reconstruction. Also state the condition of perfect reconstruction on system matrix.

2 (a) Describe Wilcoxon test and sign test.
(b) State and prove Heisenberg uncertainty theorem.

3 (a) State and prove Shannon Whittaker sampling theorem.
(b) Let X be normally distributed with mean μ and variance σ^2, where both μ and σ^2 are unknown. Use the maximum likelihood method to estimate μ and σ^2.

4(a) Using scaling relation show that

$$\hat{\phi}(\xi) = \hat{\phi}(0)\prod_{j=1}^{\infty} m_0'\left(\frac{\xi}{2^j}\right)$$

(b) Draw and derive the expression for outputs of p^{th} stage wavelet analysis and synthesis nonrecursive structure.

5 (a) Suppose M€N, and N=2M, let $u, v \in l^2(Z_N)$. Then prove that $B = \{R_{2k}u\}_{k=0}^{M-1} \cup \{R_{2k}v\}_{k=0}^{M-1}$ is an

orthonormal basis for $l^2(Z_N)$ if and only if the system matrix A(n) of u and v is unitary for each n=0,1,....M-1.

(b) Describe hypothesis test on simple linear regression.

6 (a) What is convex hull? Explain general polynomial interpolation with example. Describe Neville Aitken method to compute a curve of degree d.

(b) Describe Beizer curve and computing a point on a cubic Beizer curve.

Total No. of pages:02 Roll No.....

Ist SEMESTER M.Tech (EC-SPDD)

END SEMESTER EXAMINATION November 2019

EC-572 ADAPTIVE SIGNAL PROCESSING

Time: 3 Hrs Max. Marks: 100

Note: Answer all questions. Assume missing data if any

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1 a $u(n) = u(n-1) - 0.5u(n-2) + v(n)$, Where 10

$v(n) = 0$, $\sigma_v^2 = 0.5$

Write

i. Yule Walker equation

ii. Solve the equation for
$r(1) and\ r(2)$

iii. Find the varience of $u(n)$

b Explain Wiener filter and derive equation to minimize estimation error 10

2 a Design a notch filter that rejects a specific frequency. Show the b/w of the notch and comment on the phase characteristics of the filter 10

b Explain comb filter. Discuss with design examples the techniques to improve the quality of notching. 10

3 $\mu(n) = \sin\left(\frac{\pi n}{3}\right)$ 20

$d(n) = 2\,Cos\left(\frac{\pi n}{3}\right)$

Determine the first 3 cot vectors

(i) SDA $\mu > 1$ and (ii) LMS $\mu > 0.1$

4	a	Explain levinson durbin technique
	b	Discuss in brief about extended kalman filter
5	a	Explain in brief about Linear predictive coding
	b	Compare LMS with RLS

END

Total no. of Pages 02 *Roll no.....*

Third Semester **M.Tech.**

End Semester Examination **Nov/Dec-2019**

EC- 7214 New Technologies in Image Processing

Time: 03:00 Hrs **Marks = 100**

Note: Attempt ANY FIVE questions:

Q1(a) Differentiate between Supervised & Unsupervised learning. Name at least 2 algorithms and use case for each category. How a typical Supervised and unsupervised learning algorithm works? (8)

(b) What is linear regression? What are the assumptions for a linear regression model? What is the difference between linear regression and stochastic regression? You run linear regression on different subsets of your data, and in each subset, the beta value for a certain variable varies wildly. What could be the issue here? (12)

Q2 What is the difference between machine learning and deep learning? How does deep learning algorithms perform with reference to supervised and unsupervised algorithms? Explain the architecture of a CNN with details of layers involved. Differentiate between CNN and RNN in terms of their architecture and applications. What makes CNN suitable for vision applications? (20)

Q3 What are strengths and limitations of Decision tree algorithm. Consider the following data describing different weather conditions and decision about playing Tennis. Draw the decision tree for the data given below:

Day	Outlook	Humidity	Wind	PlayTennis
D1	Sunny	High	Weak	No
D2	Sunny	High	Strong	No
D3	Overcast	High	Weak	Yes
D4	Rain	High	Weak	Yes
D5	Rain	Normal	Weak	Yes
D6	Rain	Normal	Strong	No
D7	Overcast	Normal	Strong	Yes
D8	Sunny	High	Weak	No
D9	Sunny	Normal	Weak	Yes
D10	Rain	Normal	Weak	Yes
D11	Sunny	Normal	Strong	Yes
D12	Overcast	High	Strong	Yes
D13	Overcast	Normal	Weak	Yes
D14	Rain	High	Strong	No

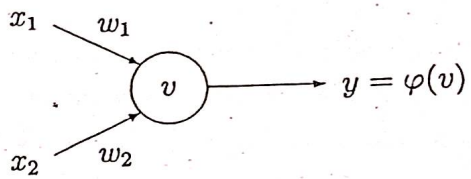
Illustrate through calculations how the nodes are placed in decision tree?

How the overfitting of training data can affect the testing result? How to avoid overfitting? (20)

Q4. How PCA can be used for high dimension data? Write the steps involved in implementing PCA? What are the limitations of PCA? Explain in detail how PCA can be used for face recognition application? (20)

Q5.(a) What is typical structure of a neural network? How neural networks can be used for handwritten character recognition? What is back propagation algorithm? What are the hyper parameters? Explain different hyper parameters related to network and training? How these hyper parameters can be obtained? (15)

(b) Consider the neural network given below:



if the weights are $w_1 = 1$ and $w_2 = 1$ and the activation function is:

$$\varphi(v) = \begin{cases} 1 & \text{if } v \geq 2 \\ 0 & \text{otherwise} \end{cases}$$

It behaves as one of the logic gates. Identify the logic gate .

Further, how to change either the weights or the threshold level of this network to realize the OR gate. (5)

Q6: (a) Why RELU is preferred over Sigmoid function in neural networks? (4)

(b) What is an autoencoder? Explain how it can be used as an initialisation method for neural networks and for data compression ? How autoencoders differ from PCA in terms of dimensionality reduction? (12)

(c) Name at least four popular deep learning frameworks? What is the advantage o these frameworks? (4)

Total No. of Pages :02

Roll No.....

SEMESTER-3rd M.Tech(SPDD)

END SEMESTER EXAMINATION Nov/Dec-2019

EC-7223 Machine Vision

Time: 3.0 Hours Max. Marks : 100

Note : Answer **five** questions out of Six.
All questions carry equal marks.
Assume suitable missing data, if any.

Q. No. 1 (a) Discuss which of the following set of data would give more compressed version of binary image:

(i) List of local maxima coordinates & Values.

(ii) List of Coordinates boundary points of object.

(iii) List having one point on boundary & the relative directions between each pair of boundary points on tracking round the boundary. (10 M)

(b) Calculate the bias in the estimated position of a hole if it is illuminated from light at angle 30 degrees to the vertical & has depth three times it's diameter.. (10 M)

Q. No. 2 (a) Estimate how the basic accuracy of a lateral histogram hole detector varies with the size of the image being used. What limits the accuracy of hole detection with Lateral Histogram method. (12 M)

(b) Can we use the following mask for line detection? Justify. (8 M)

-1. -1. 4
-1. 4. -1
4. -1 -1

Q. No. 3 (a) Write about the Plessey Cornet Detector.. (4 M)

(b) Write and compare about Maximum Likelihood and Maximum-A-Posteriori Algorithms. (8 M)

(c) A is a 8 X 8 data matrix (Choose on your own) . S is an Orthogonal Matrix derived using Hadamard Transform. Compute the B= SAS . (8 M)

Q. No. 4 (a) How do we solve aperture problem in Optical Flow?. (10 M)

(b). Write in detail about the Gaussian Mixture Model. (10 M)

Q. No. 5(a) Cross Ratio of 4 points (P1, P2,P3,P4) on a line is defined as . (10 M)

$$C(P1,P2,P3,P4) = (x3 - x1)(x2 - x4)/ (x2 - x3)(x3 - x4)$$

Explain , why this is a useful type of invariant for objects viewed under full perspective projection. Show that labelling the points in reverse order will not change the value of cross-section.

(b) Write and derive the camera calibration process. Also derive the intrinsic and Extrinsic parameters. (10 M)

Q.No. 6 . Write Note on the following:

(a) Particle Filter based tracking (7 M)

(b) Motion Detection . (7 M)

© Any Unitary Transform. (6 M)

Q.5 (a) Draw a neat diagram of three stage NMOS ring oscillator and hence show that it requires low frequency gain of 2 per stage and oscillates at a frequency of $\sqrt{3}\,\omega_0$, where ω_0 is the 3-dB bandwidth of each stage. (4)

(b) Prove that the phase angle difference 'ϕ' between input and VCO-output (when PLL is tracked) is given by $\phi = \frac{\pi}{2} + \frac{f_s - f_0}{K_v K_\phi A}$; where symbols have their usual meanings. Describe how PLL can be used for FSK demodulator. (4)

Q.6 For a simple CMOS op-amp shown in Fig.8, the W/L ratios indicated in Table 1. The op-amp is biased by D.C. supply voltages V_{DD} = 2.5V, V_{SS} = -2.5V. Determine I_B, I_C, V_C, V_B and V_{D2} for I_0 = 20μA, $V_{thn} = |V_{thp}|$ = 0.6V, $\mu_n C_{ox}$ = 20μA/V², $\mu_p C_{ox}$=10μA/V². (8)

Table 1

	Q_A	Q_B	Q_C	Q_1	Q_2	Q_3	Q_4	Q_5
W (μm)	5	10	5	20	20	5	5	90
L (μm)	5	50	5	5	5	11	11	20

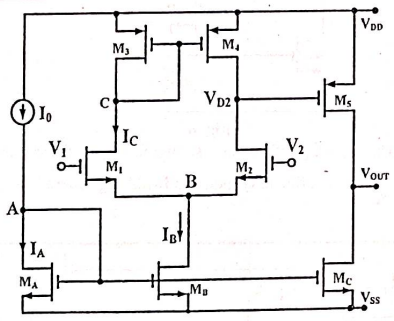


Fig. 8

Total No. of Pages 04 *Roll No. .....*

First Semester M.TECH. (VLSI and Embedded Systems)

End Semester Examination November, 2019

VLS-501: Analogue IC Design

Time: 3 Hours *Max. Marks: 40*

Note: Answer any five questions. Any missing data may be reasonably assumed. Symbols have their usual meanings.

Q.1 (a) Draw the small signal equivalent circuit for the circuit shown in Fig. 1 and hence derive the expressions for voltage gain and output resistance also calculate the value of output resistance if V_{DD} = 10V and the devices are biased at V_0 = 5V. The NMOS parameters are: $\mu_n C_{ox}$ = 20μA/V², V_{thn} = 1V, $(W/L)_1$= 60, $(W/L)_2$ = 1. The device output resistances, channel length modulation and body effect may be neglected. (5)

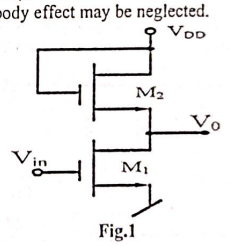


Fig.1

(b) Determine the input resistance $R_{in} = V_{in}/I_{in}$ for the identical MOSFETs as shown in Fig. 2. (3)

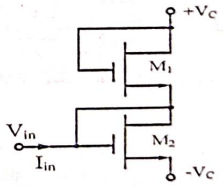


Fig. 2

Q.2 (a) For the circuit shown in Fig. 3, determine the expressions for common mode voltage gain (A_{CM}) and differential mode voltage gain (A_{DM}). State the assumptions made. (4)

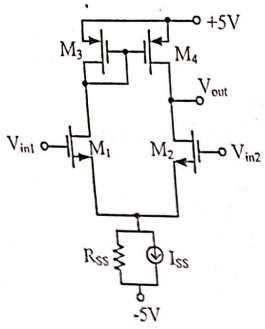


Fig. 3

(b) The NMOS gain stage is shown in Fig. 4. Draw its small signal equivalent circuit and hence derive an expression for its voltage gain. (4)

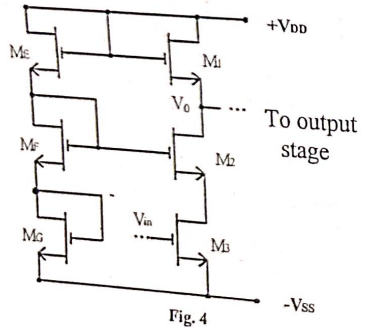


Fig. 4

Q.3 (a) Draw a neat circuit diagram of NMOS output stage and hence derive the expressions for its output voltage and output resistance. (4)

(b) Show that the circuit shown in Fig. 5 is a differential voltage controlled current source. (4)

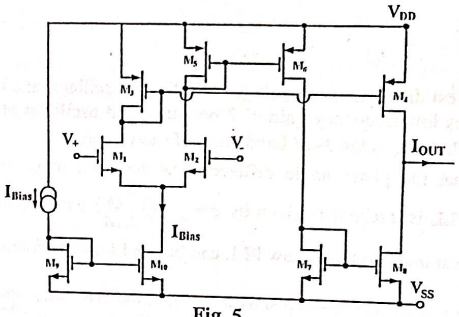


Fig. 5

Q.4 (a) Calculate the value of I_{OUT} in the circuit of Fig. 6. The MOSFETs have the following parameters: $\mu_n C_{ox} = 20\mu A/V^2$, $V_{thn} = 1V$, (W/L) = 10 and R = 10 KΩ. The channel-length modulation and body effect may be neglected. (3)

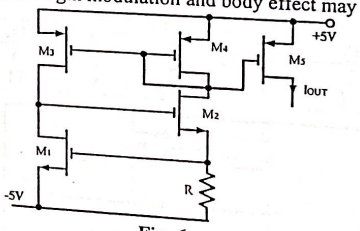


Fig. 6

(b) For the two-stage CMOS op-amp shown in Fig. 7, determine (i) the voltage gain $A_{v1} = \frac{v_{o1}}{v_{in}}$ and (ii) the unity gain bandwidth ω_{GB} .where V_{in}= (V_+ - V_-) (5)

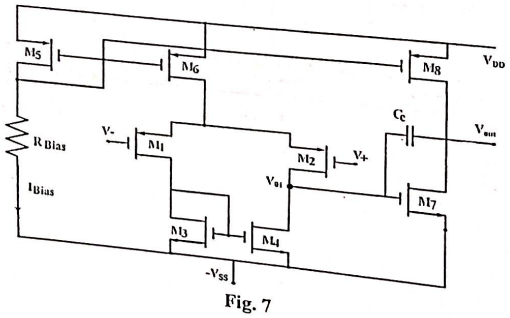


Fig. 7

Total No. of Pages-2 *Roll No.....*

FIRST SEMESTER M.TECH.(VLSI Design & Embedded System)

END SEMESTER EXAMINATION

(Nov - 2019)

VLS 503 DIGITAL CMOS IC DESIGN

Time: 3 Hours **Max. Marks: 40**

Note:	Answer any **FIVE** questions. Assume suitable missing data, if any.

1(a) What is the logic function of circuits A and B in Fig. 1? Which one is a dual network and which one is not? What will be equivalent driver to load ratio for both the circuits if $(W/L)_P=10$ and $(W/L)_N=5$? 4

(b) Find out the logic function implemented by the circuit of Fig. 2. Indicate the purpose of PMOS transistor. 4

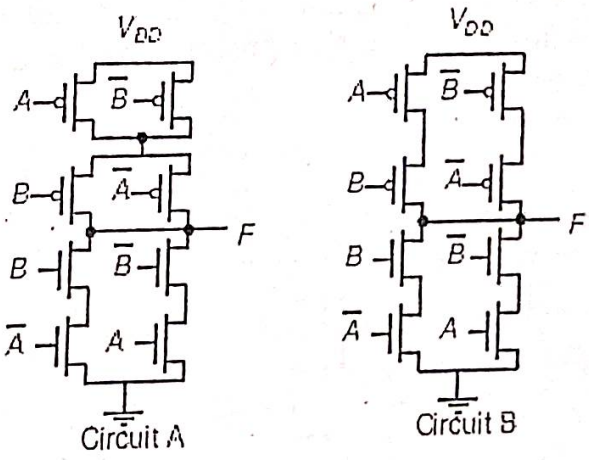


Fig.1

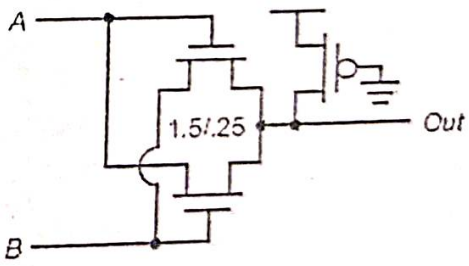


Fig. 2

2(a) Consider the circuit of Fig. 3(i) Give the logic of x and y in terms of A, B and C. Sketch the waveforms at x and y for given inputs. Do x and y evaluate to the values you expect from their logic functions? Explain. (ii) Redesign the gates using np-CMOS to eliminate any race condition. Sketch the waveforms at x and y for your new circuits. 4

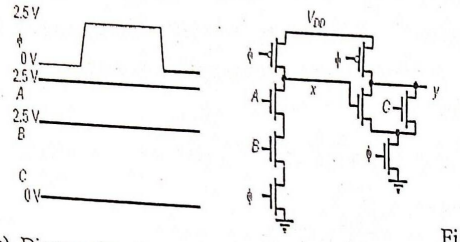


Fig. 3

(b) Discuss the charge-sharing problems in VLSI circuits. Explain various circuit techniques used in domino CMOS circuits for solving charge sharing problems. Give suitable examples. 4

3(a) Consider the circuit of Fig. 4. Assume the inverter switches ideally at $V_{DD}/2$, neglect body effect, channel length modulation and all parasitic capacitance throughout this problem. What is the logic function performed by this circuit? Explain why this circuit has non-zero static dissipation and how can this problem be fixed by using an additional transistor. 4

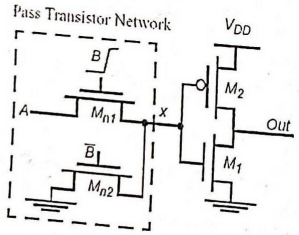


Fig. 4

(b) Compute the value of V_{OL} for a pseudo NMOS inverter having $(W/L)_P = 5$ and $(W/L)_N=10$. ($V_{DD}=3.3V$, $V_{T0,n} = 0.6V$, $\mu_nC_{ox}= 60\mu A/V^2$, $V_{T0,p} = -0.7V$, $\mu_pC_{ox}= 25\mu A/V^2$) 4

4(a) What are device isolation techniques? How do these impact on threshold voltage of small geometry devices? 4

(b) For a given value of V_{DS}, an NMOS transistor carries 1mA for $V_{GS}-V_T =$ 0.6V and 1.6mA for $V_{GS}-V_T = 0.8V$. If the device operates in linear region, calculate V_{DS} and device transconductance. Also compute the ratio of channel charge for these two cases. 4

5(a) Design dynamic shift register using transmission gates and inverter. What will be effect of clock skew on its performance? 4

(b) Design an edge triggered D flip flop using transmission gates and inverters. Explain its operation. Calculate propagation delay, setup and hold time. 4

6(a) Draw the schematic of 6T SRAM cell. How would the transistors be sized so that the data can be properly read from the cell and written into on the cell? 4

(b) Discuss the VLSI design flow with Y chart. 4

Total No. of Pages: 3 *Roll No. .....*

FIRST SEMESTER **M.Tech. (VLSI & Embedded Systems)**

END SEM EXAMINATION **(NOV-2019)**

VLS-5307 ORGANIC FLEXIBLE ELECTRONICS

Time: 3.00 Hours ***Max. Marks: 50***

Note: Answer any **FIVE** questions by selecting all parts from a particular question. All questions carry equal marks.

Assume suitable missing data, if any.

Q.1 (a) Calculate Bandwidth and Gain (in dB) of OTFT based common source amplifier. Also make Hybrid-Π models for low, high and mid frequency response. Consider circuit parameters as per Table 1; (5)

Table 1

Parameter	Value	Parameter	Value	Parameter	Value
R_1	1 MΩ	R_S	1 k Ω	Cox	1.5 nF/cm2
R_2	5 MΩ	R_{sig}	100 Ω	W	5000 µm
R_C+R_{Ch}	2.3 MΩ	CC_1	1 nF	L	25 µm
R_D	2 MΩ	CC_2	0.1 nF	L_D	10 µm
R_L	4 MΩ	C_S	1 µF	g_m	8.2 nA/V

(b) Discuss all modes of operation for dual gate organic transistor? Explain the effect of back gate biasing on performance of dual gate OTFT. (2.5)

(c) Derive the drain current equation for dual gate OTFT. (2.5)

Q. 2 (a) Derive and explain the equations to extract threshold voltage - V_T, Mobility enhancement factor - γ, Mobility - μ_0 and µ, and source resistance - R_S in saturation region through differential analytical model. (5)

(b) Explain different simulation strategies to incorporate while validating the performance of BGTC (Bottom Gate Top Contact) and BGBC (Bottom Gate Bottom Contact) organic TFT against fabricated devices. (2.5)

(c) Re-design the given circuit (Fig. 1) for hazard free operation. (2.5)

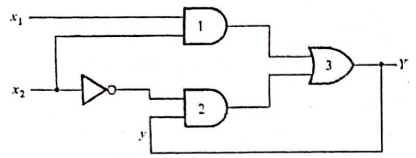


Fig. 1

Q. 3 (a) Extract the values of threshold voltage - V_T, Mobility - μ, and current on-off ratio in saturation region using data given in Table 2 for P-Type OTFT with W = 1 µm, L= 50 nm and PMMA dielectric layer of 10 nm. Also find the value of channel resistance at V_{GS} = -10 V. (5)

Table 2

V_{DS} = -5.0 V	
V_{GS} (V)	I_D (A)
0	-1×10^{-10}
-2	-4×10^{-07}
-4	-2×10^{-06}
-6	-5×10^{-06}
-8	-9×10^{-06}
-10	-12×10^{-06}

(b) Why device threshold voltage reduction is the viable solution for reducing the average power of inverter circuit. (2.5)

(c) Explain block diagram of two 10-bit number (X and Y) comparator with gated clock scheme. (2.5)

Q. 4 (a) Design a CMOS organic inverter by determining the channel widths Wn and Wp of the N-Type transistor ($\mu_n C_{ox}$ = 120 µA/V², V_{Tn} = 0.8 V, L = 0.6 µm, W_{min} = 1.2 µm) and P-Type transistor ($\mu_p C_{ox}$ = 60 µA/V², V_{Tp} = -1 V, L = 0.6 µm, W_{min} = 1.2 µm) transistors to meet the following performance specifications.

- Switching threshold voltage; V_{th} = 1.5 V for V_{DD} = 3V
- Propagation delay times; $\tau_{PHL} \leq$ 0.2 ns and $\tau_{PLH} \leq$ 0.15 ns
- A falling delay of 0.35 ns for an output transition from 2 V to 0.5 V, assuming a load capacitance of 300 fF and ideal step input. (5)

(b) Discuss the role of Emission layer, Carrier Injection Layer, Carrier Transport Layer, and Carrier Blocking layer for the performance of Organic Light Emitting Diode. (5)

Q. 5 (a) How bootstrapping technique is beneficial for improving voltage swing of the inverter using one type of transistor only. Derive the expression for ratio of bootstrap capacitor and source capacitor (C_{boot}/C_s). (5)

(b) Differentiate All-P organic inverter using DLL and ZVLL techniques. (2.5)

(c) Using Domino Logic, make the circuit and observation table (for first 8 inputs combinations only starting from 00000000) for given expression (2.5)

$$Y = [(A+B+C).(D+E).FG] + H$$

Q. 6 (a) What do you mean by static noise margin in SRAM. Explain read and write operation of 6-T SRAM cell with deriving necessary ratios for pull-up, pull-down and access transistors. (5)

(b.1) Write any 5 application areas of organic transistor (1)

(b.2) Differentiate HOMO and LUMO. (1)

(b.3) How bonds are different in organic and inorganic materials? (1)

(b.4) Make the circuit of All-P organic NAND gate using DLL technique (1)

(b.5.1) Make the structure of cylindrical OTFT. (0.5)

(b.5.2) Who got the Nobel Prize in 2000 for identifying conducting polymers. (0.5)

Total No. of Pages: 01
First Semester
End Sem. Exam

Roll No.: .....
M.Tech. (VLSI Design)
Nov. 2019

VLS-5407: IC TECHNOLOGY

Time: 03 hours

Max. Marks: 50

Note: All questions are compulsory

Assume suitable missing data, if any.

1. Compare systematically the different BJT manufacturing techniques, giving their pros and cons. [10]

2. Explain n and p well formation process in CMOS process flow. [10]

3. What is an LDD device? How do we create LDD structure in current silicon technology? [10]

4. [a] Why do we need to adjust the threshold voltage in modern silicon devices? [5]
   [b] Why is polysilicon used as gate material instead of aluminium in MOSFETs? [5]

5. Explain the steps involved in gate formation in CMOS process flow. [10]

END

1ST SEMESTER OLD SCHEME M.Tech. [VLSI]

Roll No.....

END SEMESTER EXAMINATION (Nov-2019)

EC-512 IC Technology

Time: 03 Hours Max. Marks: 100

Note: Answer any five questions.
Assume suitable missing data, if any.

Q. 1 a) Explain LOCOS and the significance of thick and thin oxides. Discuss various oxide thickness measurements. (10)

b) Explain oxide isolation defects and stacking faults. Discuss various reasons for the same faults. (10)

Q. 2 a) Explain the steps involved in typical epitaxial process and sources of Silicon VPE, Gallium Arsimate VPE. Also explain kinetics of growth and transport process. (10)

b) Draw the schematic of Molecular beam epitaxy growth system and explain. Derive expressions for calculation of mean free path. (10)

Q. 3 a) Boron with an energy of 100 KeV is implanted into a 0.18 ohm cm n-type silicon wafer to achieve a peak concentration of $1 \times 10^{18}/cm^3$.

i) Determine the location of the pn junction.

ii) What thickness of silicon dioxide is required to mask this ion implantation?

Assume the projected range and straggles in Si and SiO_2 are the same and the criterion of minimum silicon dioxide thickness is that the implanted concentration is less than 1\10 background concentration at the interface between the silicon dioxide. (10)

b) Compare the oxide thickness grown for short-time and long-time oxidation at a temperature of 1200°C by wet oxidation method. At 1200°C, A = 0.05 μm, B = 0.720 $\mu m^2/h$, Z = 0. (10)

Q. 4 (a) Discuss various reactions used to deposit films on device wafers in Chemical Vapour Deposition process. Explain reactors used for CVD process. (10)

(b) Define patterning, why it is required? Discuss various problems associated with metallization and also explain postmetal processing steps. (10)

Q. 5 a) Explain process sequence for fabrication of nMOS IC technology with suitable diagrams. What are various considerations for nMOS ICs? (10)

b) Explain the terms associated with CMOS ICs: Isolation, Latch up, Gate material and Threshold adjustment. (10)

Q. 6 a) What is the sequence of processes that would be required to go from the completed wafer to a packaged device using beam bad bonding and assembly in a ceramic DIP package? Sketch the process flow. (10)

(b) What is meant by surface mount technology? Describe the total steps involved in mount a chip with this technology starting from the unscribed wafer? Under what condition it is preferred? (10)

Q. 7 Write note on the followings:

a) Packaging design considerations.

b) CMOS IC technology processing steps. (10x2=20)

Total No. of Pages-2 *Roll No.....*

FIRST SEMESTER **M.TECH.(VLSI Design & Embedded System)**

END SEMESTER EXAMINATION

(Nov - 2019)

EC-513 VLSI DESIGN

Time: 3 Hours **Max. Marks: 100**

Note: Answer any **FIVE** questions. Assume suitable missing data, if any.

1. (a) Give CMOS logic gate implementation of **10**

$$Z = \overline{(A.B.C) + (D.E)(F+G)}$$

What will be equivalent pull up to pull down aspect ratios of Z if $(W/L)_P=10$ and $W/L)_N=5$?

(b) Implement a 4: 1 multiplexer with (i) static CMOS and (ii) transmission gate logic. Asses the efficiency of each in terms of the number of transistor used and total implementation area. Which one would be a preferred choice? **10**

2. (a) Discuss the charge-sharing problems in VLSI circuits. Explain various circuit techniques used in domino CMOS circuits for solving charge sharing problems. Give suitable examples. **10**

(b) What is multiple output domino logic (MODL)? Design the following Boolean functions using MODL **10**

$F_1 = A(B+C), F_2 = A(B+C).DE, F3 = A(B+C)\ DEF$

3. (a) Design an edge triggered D register using transmission gates and inverters. What will be the clock to Q delay of the register? **10**

(b) Design a two-phase dynamic register using pass gate and enhancement load inverter. Is the circuit ratioed? **10**

4. (a) Derive an expression for switching threshold voltage of CMOS inverter. Consider a CMOS inverter with the following device parameters:

$V_{To,n} = 0.6V$, $\mu_n C_{ox} = 60\ \mu A/V^2$, $V_{To,p} = -0.8V$. $\mu_p C_{ox} = 20\ \mu A/V^2$

$V_{DD} = 3V$ and $\lambda = 0$

Determine the aspect ratios of the nMOS and pMOS transistors such that switching threshold is 1.5V. **10**

(b) For problem 4(a), compute the rise time, fall time and propagation delays τ_{PHL} and τ_{PLH} using average current method (Load Capacitance = 300fF). What changes would you expect if the timing parameters are computed using exact method. **10**

5. (a) List the steps for fabrication of a CMOS inverter in n well process. Aid your answer with suitable diagrams. **10**

(b) What are the different components of threshold voltage of MOS transistor? A pMOS transistor is fabricated on n-type substrate with bulk doping density of $10^{16}cm^{-3}$, gate doping density (n type poly) of $10^{20}cm^{-3}$, $Q_{ox}/q = 4x10^{10}cm^{-2}$ and gate oxide thickness of 0.1μm. Calculate the threshold voltage at room temperature for $V_{SB} = 0$. Use $\varepsilon_{Si} = 11.7\ \varepsilon_o$. What kind of channel implant would be needed to make $V_T = 0$? Also find its concentration. **10**

(4x5)

6. Write short note on any four
   (a) Y chart representation of VLSI Design flow
   (b) MOS capacitances
   (c) Design rules
   (d) Regularity, modularity and locality
   (e) Elmore delay model
   (f) Device Isolation Techniques

Total No. of Pages: 1

II (Second) SEMESTER **M.Tech. (ECE)**

END-TERM EXAMINATION

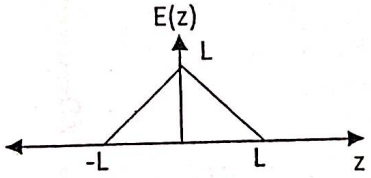
EC 7021 (Optical Computing)

November, 2019

Time: 3:00 Hours ***Max. Marks : 100***

NOTE: Assume suitable missing data, if any.

1. What is optical computing? Explain mathematically, why is it beneficial over other types of computing? [10]
2. With a suitable diagram, elaborate the components and interconnections in a Shufflenet multistage interconnection network. Explain the routing algorithm, for a 3-level shufflenet. [15]
3. Explain the Fresnel Approximation, physically and mathematically, starting from the fundamental principles. [10]
4. Write short notes on **any 2** of the following: [15]
   (a) Limitations of Gabor Hologram
   (b) Applications of Holography
   (c) Bragg Effect
5. What is holography? With the help of a suitable diagram, and appropriate equations, explain the recording and reconstruction of a hologram. [15]
6. Explain the working of a 4-F correlator in detail. [10]
7. Consider a long narrow slit in the y-direction which is covered with an amplitude mask, so that the field is made to drop-off linearly from the center as shown below. Using Fourier optics, calculate the diffracted Fraunhoffer field for normally incident monochromatic light. [15]



8. A *p–n* photodiode has a quantum efficiency of 50% at a wavelength of 0.9 μm. Calculate: [10]
   (i) its responsivity at 0.9 μm;
   (ii) the received optical power if the mean photocurrent is 10^{-6} A;
   (iii) the corresponding number of received photons at this wavelength.

Q.11 Explain the following terms: (10)

(a) Exhaustive testing of FPGAs
(b) k-diagnosable testing technique
(c) 0-diagnosable BIST for FPGA
(d) Fault Latency

Q.12 Consider 2 modules A and B. Each of these modules uses counters for a different reason. Module A uses the counter to flag an operation every 256 clocks. Module B uses a counter to generate a PWM pulse of varying duty cycle with a fixed frequency of 5.5kHz. Design the **digital circuit** with and without resource sharing for the two modules. (10)

********** END**********

Total No. of Pages:04

M.Tech (ECE)- VLSI Design and Embedded Systems III Sem

END-TERM EXAMINATION

EC 7123 (Advanced topics in VLSI Design)

November, 2019

Time: 3 Hours *Max.Marks:100*

Note: Answer **any 10** questions. Assume suitable missing data, if any. All questions carry equal marks.

Q.01 (a) Why does IEEE 754 standard use biased exponent representation and place it before the significand? (2)

(b) Add 3 to 3×2^{-23} using floating point arithmetic and give the results with round up and round down. (5)

(c) Represent 15213 in IEEE 754-32 bit floating point format. (3)

Q.02 (a)Draw the RTL schematic for the following code:(3)

```
Module new (
Output reg oDat,
Input iReset, iclk,
Input iDat1, iDat2);
always@(posedge iclk or negedge iReset)
if (! iReset)
oDat <= 0;
else
oDat <= iDat1| iDat2;
endmodule
```

(b) Redesign the RTL schematic for above code assuming there is no reset logic in code and the given FPGA has FDS elements. Which of the two designs will be more optimized? Give reasons for your answer. (5)

1 20 5 1

(c) Why is it suggested to avoid set or reset whenever possible if area is the key consideration for an FPGA based design? (2)

Q.03 (a) **"By removing the pipeline registers, we can minimize the input to output timing."** Give reasons and prove this statement correct with the help of an example (RTL schematic). (5)

(b) Write any four features of systolic arrays. How are they different from pipelining? (5)

Q.04 Explain with the help an example (code and RTL schematic) how **register balancing** improves timing. (10)

Q.05 What are the two types of **Reconfigurable processing fabric**? Write down any **six features** of the functions for which a reconfigurable fabric can provide a significant benefit. Draw the block diagram of the **segmented interconnect architecture** of an FPGA and explain how is it better than the **nearest neighbour – style architecture**. (10)

Q.06 (a) Explain pipeline stage reconfiguration with the help of an example. (5)
(b) Write any two differences between structural and functional technology mapping algorithms. (5)

Q.07 For the circuit shown in **Figure 1**, (10)
(a) Draw the directed acyclic graph.
(b) Find inode(s), onode(p), inode(q) and onode(w).
(c) Assuming 3-input LUT, find the set of of admissible cuts $\Phi(r)$ at node r.

(d) How many minimum number of 3-input LUTs are required to map this circuit. Show the cones on the DAG for mapping.

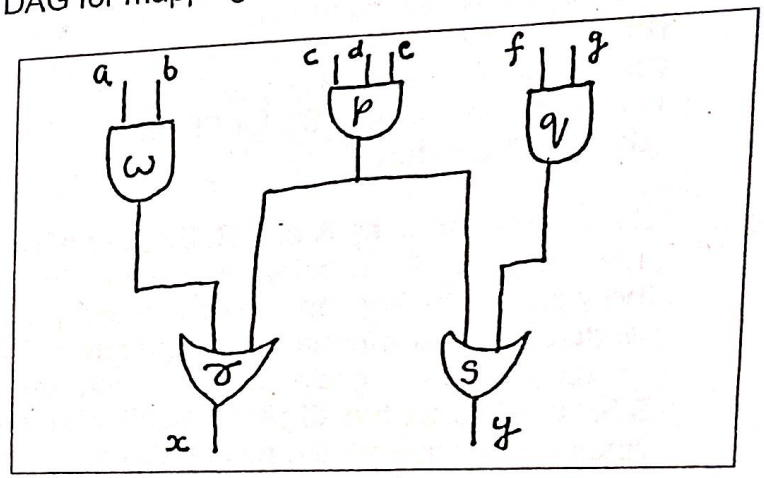


Figure 1

Q.08 (a) Write any two differences between RASP and V-Pack algorithm. (4)
(b) Explain simulated annealing for placement in technology mapping of FPGAs and write its pseudo code. (6)

Q.09 How the costing of cuts are done for power optimization? Explain the meaning of Nodes and Support of a cut with the help of an example. Is replication of logic beneficial for power optimization? Give explanation with reason. (10)

Q.10 Write the expression of maximum speed up achieved as per Amdahl's law. Write down the steps involved in hardware/ software partitioning of an application. How Xilinx is supporting hardware software codesign? (10)

Total No. of Pages :03

II-SEMESTER

Roll no _____

M.Tech(VLSI)

END SEMESTER EXAMINATION *May2019*

EC – 7113: SOFT COMPUTING

Time: 3:00 Hours ***Max. Marks: 100***

Note: Answer any two questions under each part.
Assume suitable missing data, if any.

Part-I

1. (a) How is supervised learning neural network different from unsupervised learning? Explain any one supervised single layer neural network. 5
(b)Compare and contrast biological neuron with artificial neuron. 5

2. (a) Explain the learning algorithm of Mc.Pulloch-Pitts Network. 5
(b) Design a Hebb Network to implement logical AND function(use bipolar inputs and targets). Assume initial weights, bias equal to 0. 5

3. (a) Explain the building blocks and applications of perceptron network. 4
(b) Explain the architecture of back propagation network. Explain how the learning takes place using back propagation network. 6

Part -II

1. Describe in detail formation of inference rules in a Mamdani and Takagi-Sugeno FIS. 10

2. How is a fuzzy relation converted into a crisp relation using lamda-cut process? Explain in detail various methods employed for converting fuzzy data into crisp data. 10

3. What is a decision boundary of a linearly separable problem in ANN? How is linear separability explained in perceptrons? 10

Part III

1. How is an interval analysis done in fuzzy arithmetic? Discuss the mathematical operations performed on Fuzzy Intervals. 10

2. *It is necessary to compare two sensors based upon their detection levels and gain settings. The table of gain settings and sensor detection levels with a standard item being monitored providing typical membership values to represent the detection levels for each sensor is given below in table 1.*

Gain Setting	Detection level of Sensor 1(D1)	Detection level of Sensor 2(D2)
0	0	0
10	0.2	0.35
20	0.35	0.25
30	0.65	0.8
40	0.85	0.95
50	1	1

Find the following membership function for the universe of discourse X={0,10,20,30,40,50}

(i) $\mu_{D1 \cup D2}$ (ii) $\mu_{D1 \cap D2}$ (iii) $\mu_{D1 | D2}$ (iv) $\mu_{(D1+D2)}(x)$ (v) $\mu_{(D1.D2)}(x)$ 10

3. What are the various methods of membership value assignment? 10

Part IV

1. What is the difference between genetic algorithms and traditional optimization techniques? With a neat diagram explain the operation of a simple genetic algorithm. 4+6

2. Solve the 'knapsack' problem using genetic algorithm. The values of parameters are given below in the table. The size of the knapsack is 12 kgs. Optimize the weights so that the knapsack yields maximum value without breaking it. Also mention the methods chosen for encoding, selection, cross-over and mutation. 10

ITEMS	WEIGHT(KGS)	VALUE
A	5	12
B	3	5
C	7	10
D	2	7

3. Write a short note on the following
   (a) Types of selection methods in Genetic Algorithm
   (b) Cross-over techniques
   (c) Conditions when mutations are done
   (d) How can global maxima reached during the evolution process using genetic algorithm? 4X2.5=10

Part V

1. What are the characteristics of Neuro-Fuzzy Systems? How are the Neuro-Fuzzy system classified? 4+6=10

2. Explain Bidirectional Associative Memory Networks in details 10

3. Explain types of neuron connection architecture in detail. 10

Roll No. .....

Total No. of Pages 1

M.Tech.

1st SEMESTER

Nov/Dec-2019

END SEMESTER EXAMINATION

Water Pollution

PAPER CODE EN-501

Max. Marks: 100

Time: 3:00 Hours

Note : Answer any five questions
All questions carry equal marks.
Assume missing data, if any.

Q1. (a) Discuss about the water resources of India in detail

(b) Discuss status of rainfall in India. Although we have good rainfall even though why we face water problem. Discuss various measures to be taken for proper management of water resources.

Q.2 (a) What are the problems associated with the rivers of our country. Discuss the problems associated with the pollution of river Ganga. Also discuss the basin approach for cleaning river Ganga.

(b) Discuss various legislation associated with the cleaning of rivers and role of various ministries for the same.

Q.3 (a) What are various parameters used for determination of quality of water. Discuss any two parameters mentioning their determination in the lab and their significance & standard.

(b) Discuss various methods of disposal of sewage. A drain is being discharged in river having discharge and BOD 60 cumecs and 6 mg/l respectively. Find the quality of river after sewage disposal if discharge and BOD of drain is 5cumecs and 70 mg/l respectively.

Q.4 (a) What are water pollutants? Discuss industrial waste, domestic sewage and agricultural waste as sources of water pollution.

(b) Classify and discuss pollutants based on their nature and stability. Also discuss biological accumulation of heavy metals in the body tissues of organisms.

Q.5 (a) What are different types of models? Discuss models for microbial decay in water pollution.

(b) Differentiate natural Eutrophication and accelerated Eutrophication. Also discuss problems and effects of eutrophication.

Q.6 Write short notes on any four:

(a) D.O. Models
(b) Radioactive pollution
(c) Thermal pollution
(d) Toxicity of metals to organisms
(e) Degradation of organic matter
(f) Fate of movement of oil in marine environment
(g) Disease causing agents

CE

Total No. of Page 1

Roll No. .....

First Semester

M.Tech.

END SEMESTER EXAMINATION
November 2019

ENE – 503 AIR POLLUTION & CONTROL

Time: 3:00 Hours

Maximum Marks: 40

Note: Attempt any 4 questions. Question no. 6 is compulsory. Assume suitable missing data, if any.

1. Describe the various scales which are generally used to describe the concentrations of gases. In addition to this also explain the Stokes' law and its application in atmospheric pollution. (10)
2. Write the different chemical reactions in the atmosphere which are involved in the removel of SO_2 and NOx. Also explain the different factors that are associated with the degree of adverse impact of different gaseous pollutants on human beings along with the health effects of SO_2, CO, NOx, HC and photochemical opxidants. (10)
3. Explain plume behaviour in various atmospheric conditions with figures. SO_2 is present in standard atmoshpheric air at a concentration of 80ppm. Calculate the mass-volume concentration for the above mentioned gas. (10)
4. What is difference between subsidence and radiational inversion? Describe the various methods which are used for the sampling of smaller size particles. (10)
5. Write the significance of sampling in air pollution inversitigations. Explain the principle, construction and working of a settling chamber. (10)
6. Write short notes on the followings: (10)
   (a) Wet Precipitation
   (b) Atmospheric stability

Total no. of pages 02

Roll No.....

1ST SEMESTER

M.Tech.

END SEMESTER EXAMINATION

November *2019*

ENE 5401 Industrial Wastewater Treatment

Time: 3:00 hours

Max. Marks: 50

Note: Answer ANY FIVE questions.
Assume suitable missing data, if any

1. A completely mixed activated sludge plant is to treat 10,000 m^3/day of industrial wastewater. The wastewater has a BOD_5 of 1200 mg/l that must be reduced to 200 mg/l prior to discharge to a municipal sewer. Pilot plant analysis indicates that a mean cell residence time of 5 days maintaining MLSS concentration of 5000 mg/l produces the desired results. The value of Y is determined to be 0.7 kg/kg and the value of k_d is found to be 0.03 d^{-1}. Determine:
   (a) The volume of the reactor
   (b) The mass and volume of solids wasted each day
   (c) The sludge recirculation ratio. 10

2. [a] For biological removal of Phosphorous from wastewater, anaerobic digestion is carried out prior to aerobic degradation which is very unlike the typical wastewater treatment. Enumerate the reasons for the same. 5
   [b] Compare the anaerobic treatment and aerobic treatment of wastewater with emphasis on the advantages and disadvantages of one over the other. 5

3. Name the two most water intensive industries out of the ones being studied in class and explain the wastewater treatment methodologies applied therein, specific emphasis on characteristics of wastewater generated from each and typical treatment flowchart. 10

4. [a] Since fertilizer and pesticide industry use considerable amounts of Nitrogen as the raw material – what kind of biological treatment would you prefer to give to wastewater generated from the same? Explain the process in detail. 7.5

[b] Explain the concept of air stripping when it comes to Ammonia removal from wastewater. 2.5

5. [a] Why is treated wastewater not recycled in the textile industry?
[b] Purpose of Equalisation and Neutralization tanks in wastewater treatment?
[c] Explain the working principle of UASB.
[d] Advantages and disadvantages of Trickling Filter over Activated Sludge process. 2.5x4

6. With respect to wastewater treatment, define the following:
(i) Biomass
(ii) Growth phase
(iii) Tertiary treatment
(iv) Endogenous phase
(v) Suspended cultures
(vi) Attached cultures
(vii) Physio-chemical treatment
(viii) Biological treatment
(ix) Lag phase
(x) Stationary phase

1x10

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Total No. of Pages: 1 *Roll No.....*

FIRST SEMESTER M.TECH. (ENE)
END-SEM EXAMINATION NOV. – 2019
ENE- 5301 ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

Time: 03 Hours *Max. Marks: 40*

Note: Attempt any five questions
Assume suitable missing data if any

1. a) Describe the importance of chemical equilibrium in aquatic chemistry. 04
   b) Briefly discuss unique properties of water and their environmental significance. 04

2. a) What are surfactants? What are the environmental problems associated with surfactants. Discuss. 04
   b) Define pesticides. Why are the pesticides of environmental concern? Explain. 04

3. a) Explain the mobility and fate of mercury in environment. 04
   b) Discuss the chemistry of CFCs and their role in catalytic destruction of ozone. 04

4. Write short notes on (2 x 4)
   a) Eutrophication
   b) Redox reactions
   c) RBC
   d) Biogas

5. a) Describe the key phases of microbial growth and dynamics. 04
   b) What is green house effect? Define green house gases. What are the environmental consequences of global warming? Discuss. 04

6. a) Compare the aerobic and anaerobic microbial transformation of nitrogen. 04
   b) Discuss the role of fungus in lignin degradation. 04

7. a) Briefly discuss acclimatisation of waste. 04
   b) What are biofilters? Explain the working and environmental benefits of biofilters. 04

ENE

Total No. of Page 2 Roll No. .....

Third Semester (Part-Time) M.Tech.

END SEMESTER EXAMINATION
November 2019

CE – 561 AIR POLLUTION & CONTROL

Time: 3:00 Hours *Maximum Marks: 100*

Note: Attempt any 6 questions. Question no. 7 is compulsory.

Assume suitable missing data, if any.

1. Enumerate the different emission sources in India. What are the different environmental factors that will affect the future population growth in India? Write in detail and justify with suitable data. (15)
2. Write the difference between epidemiological and toxicological studies with suitable examples. In addition to this, also describe the sources and health effects of Pb, Cd, Ni and Hg in the atmosphere. (15)
3. What is lapse rate? Explain it with reference to temperature profile of the different layers of the atmosphere with the help of a suitable diagram. (15)
4. What is the objective of air sampling exercise? Draw a diagram for typical air sampling setup along with the different methods which are used to collect the gaseous air pollutants from ambient atmosphere. (15)
5. Expalin the theory, concept and application of cyclose separator through a suitable digram. Also write the advantage and disadvantage of wet collectors. (15)
6. Describe the role and significance of carbon cycle in the environment with an appropriate digram. In addition to this, also explain the effect of different pollutants on vegetation in megacity Delhi. (15)
7. Write short notes on the followings: (25)
   (a) NAAQS in India
   (b) Wet Precipitation
   (c) Packed Towers
   (d) Interaction of SO_2 and CO at the Earth's Surface
   (e) Diagram of dynamic behiaviour of photochemical smog

ETE

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Total Number of pages 02

Roll No. .....

THIRD SEMESTER

M.Tech. (ENE)(PT)

END SEMESTER EXAMINATION

(NOV-DEC-2019)

CE-562 Water Engineering Design

Time : 3 Hours

Max. Marks : 100

Note : Answer all question by Selecting any two parts from each questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q 1(a) What are the common sources of water for a water supply scheme? State the factors that govern the final selection. 10

(b) (i) In a water treatment plant, the pH values of incoming and outgoing waters are 7.5 and 8.9 respectively. Assuming a linear variation of pH with time, determine the average pH value of water. 10
(ii) Prove that the area and overflow rates rather than the detention period govern the design of a settling tank.

(c) Explain the units of clariflocculator. 10

Q 2(a) Explain the types of Aerations system. 10

(b) Design a river intake with respect to (i) number & size of the opening in the intake well; (ii) size, shape & height of the intake well; (iii) the gravity pipe for raw water connecting the intake well and jack well. The data supplied is :- 10
R.L. of river bed = 115m
R. L. of lowest water level = 118m
R. L. of high flood level = 127m
R. L. of normal water level = 122m
Population = 95,000
Average water demand = 250l/head/d.

(c) Explain the types of intake structure. 10

Q 3(a) 10 mg of copperas is consumed with lime at a coagulation basin, per litre water. Determine the quantity of copperas and the quick lime required to treat 15 million litres of water. 10

(b) A coagulation – sedimentation plant clarifies 50 million of water every day. The quantity of filter alum required at the plant is 25 mg/l. If the raw water is having an alkalinity equivalent to 5 mg/l of $CaCO_3$, determine the quantity of filter alum and the quick lime (containing 75% of CaO) required per year by the plant. 10

(c) A rectangular sedimentation basin is to handle 10 million litres/day of raw water. A detention basin of width to length ration of 1/3 is proposed to trap all particles and 20°C as the average temperature, compute the basin dimensions. If the depth of the tank is 3.5 m, calculate the detention time. 10

Q 4(a) Explain Ion Exchange Processes. 10

(b) A filter unit is 5.5 m by 10.0 m. After filtering 10,000 cubic metre per day in 24 hour period, the filter is back washed at a rate of 10l/sw m/sec. For 15 min. Compute the average filtration rate, quantity, and percentage of treated water used in washing, and the rate of wash water flow in each trough. Assume 5 troughs. 10

(c) Design the approximate dimensions of a set of rapid gravity filters for treating water required for a population of 50,000 ; the rate of supply being 180 litres per day per person. The filters are rated to work 5000 litres per hour per sq m. Assume whatever data are necessary, and not given. 10

Q 5(a) (i) What is meant by 'disinfection' in treating public water supply? What is its importance? 10

(ii) Chlorine usage in the treatment of 25,000 cubic metre per day is 10 kg/day. The residual after 10 min. contact is 0.20 mg/l. Calculate the dosage in milligrams per litre and chlorine demand of the water.

(b) Design a rectangular sedimentation tank to treat 3570 m^3/day of coagulated water. Make necessary assumptions. Sketch the inlet, outlet and sludge removal arrangements. 10

(c) Explain the following terms:-

(i) Water Softening.

(ii) Reverse osmosis. 10

-END-

ENE

Total No. of Page 2

Roll No. .....

Third Semester

M.Tech.

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END SEMESTER EXAMINATION
November 2019

CE – 7121 AIR QUALITY MODELING

Time: 3:00 Hours *Maximum Marks: 100*

Note: Answer any 7 questions.
Question No. 8 is compulsory.
Assume suitable missing data, if any.

1. What do you understand by the term 'Air Pollution Index'? Explain the various methods of determining the air pollution index and its significance. Also write the AQI of India with its colour code. (15)
2. Describe the detail procedure for assessing air quality impacts due to transportation interventions along with appropriate flow diagram. (15)
3. What are the different applications of air pollution model in real word emission? Illustrate the role of different meteorological elements in the dispersion of air pollutants. (15)
4. Classify air pollutants into different categories on the basis of their origin, chemical composition and state of matter with suitable examples. Also explain the different factors that affect the vehicular emission in India. (15)
5. Write the name of any two deterministic, Numerical, Statistical and hybrid models. Also write NAAQS for India. (15)

6. What are the key indicators of environmentally sustainabl transport system? Explain plume behaviour in variou atmospheric conditions with figures. (15

7. If the total number of vehicles in Delhi is 8827431 and th percentage contribution of different category of vehicles are 31.6 for car, 64.3% for two wheelers, 0.9% for autorickshaw, 0.22% f buses and 1.8% for trucks, then calculate the per day emission NOx, and PM from the above mentioned category of vehicles. (1

Vehicles	Emission Factor (gm/km-hr)	
	PM	NOx
Car	0.0301	0.304
Two Wheelers	0.021	0.31
Mini Bus & Mini Truck	0.475	2.12
Auto-Rickshaw	0.0665	0.345
Bus	0.044	6.21
Truck	1.24	9.3

8. Write short notes on any two of the followings? (10)
   (a) Indexing for South Korea
   (b) Subsidence Inversion
   (c) Standard deviation of horizontal and vertical plu concentration, if a = 68, b = 0.894, c = 44.5, x = 4, d = 0. and f = -13

ENE

Total no. Of pages 02 *Roll No.....*

THIRD SEMESTER EXAMINATION **M.Tech.(Env Engg)**
END SEMESTER EXAMINATION **Nov 2019**
CE-7111 ENVIRONMENTAL IMPACT ASSESSEMENT AND AUDIT
Time : 3 Hours **Max. Marks : 100**

Note: Attempt any five questions. Draw neat labelled diagrams wherever necessary. Assume suitable missing data if any.

Q 1 A highway alignment is proposed with four alternatives A1, A2, A3, and A4, having varying would be levels of ease in service, and environmental impacts to the localities as shown in the accompanying table. Using a suitable method, determine the best alternative out of four, which will have least of the impact, and maximum output from the point of view of ease of service. The level of significance of each impact area is shown against it in [ ] (20)

Impact Area	Highway Alternatives			
Market Access (Average Time to city centre) [4]	25	18	14	17
Level of Service (Average Travel Speed Kmph) [5]	50	45	40	42
Provision of Public Service (Police Response Time in Minutes) [7]	11	8	10	12
Disruption of Homes [10]	15	14	40	20
Disruption of Business units, Number [10]	2	6	10	4
Noise (dBA at 100 ft) [6]	75	65	70	50
User's Cost (Rs Crores) [1]	10	10	8	12

2(a) Explain Matrix Method for the assessment of Environmental Impacts. Exemplify your answer by using Land Form, Water, Air Quality, and Economic Value as Environmental Conditions and Habitat Construction, Impounding Water, and Fertilizer Use as Proposed actions. (10)

2(b) Explain various approaches that may be adopted for the Prediction of Impact of any activity on air environment. (10)

3(a) Explain the Network method for the assessment of Environmental Impacts. (10)

3(b) Explain how would you plan and carry out the baseline studies for the assessment of impacts on air environment. Also explain Emission Inventory steps involved in making such inventory in that regard. (10)

4(a) List crucial factors which are linked with impacts related to water surface and/or subsurface water environment. (10)

4(b) Explain how construction activities, Urban/Suburban Growth, Power Plants, Impoundment of Water, and Agricultural operations impact water quality/quantity. (10)

5(a) Explain the method of Habitat Evaluation System for the assessment of Biotic Impacts of a Project/Action. (10)

5(b) Explain the terms Habitat, Biodiversity, Ecosystem, Ecosystem carrying capacity, and Ecological Succession. (10)

6(a) What are the impacts of (i)air pollution and (ii) alteration of water resources on biotic species (10)

6(b) Discuss the general conceptual approach for the assessment of impacts on air/water/noise or social environment. (10)

7(a) Discuss the scope of Socio Economic Impact Assessment and the indicators to be selected for the assessment of impacts. (10)

7(b) Explain the methodology to be followed for the assessment of Socio Economic Impacts of Projects/ Actions. (10)

Total No. of Pages- 1 Roll No.----------

First Semester Ph. D. Course Work (Elective)

END SEMESTER EXAMINATION NOV-DEC 2019

HU - 702: Engineering and Technology for Inclusive Growth

Time: 3 Hours Max Marks: 70

Note: Answer any five questions.
Assume suitable Missing data, if any

1. What do you mean by Inclusive Growth? Discuss role of engineering and technology in achieving Inclusive Growth. 7+7=14

2. Why technology is required by the lower segment of the society? Discuss a framework through which State after liberalization and globalization can provide technology to them? Discuss. 9+5=14

3. What do you mean by Sustainable Development Goal (SDGs)? How it is different from Millennium Development Goal (MDGs)? Discuss. 7+7=14

4. Discuss theories of Economic Growth which suits a labour surplus country like India. 14

5. What do you mean by Corporate Social Responsibility? Critically examine the role of Corporate Social Responsibility (CSR) towards lower segment of the society. 4+10=14

6. Corporate sector is for profit organization. Why there is need of discussing issues of agriculture to achieve inclusive growth in India? Suggest some technological measures which may be taken in agriculture to achieve inclusive growth. 7+7=14

7. What should be done for transfer of new knowledge among farmers? Discuss with suitable examples. 14

-End-

Total No. of Pages 01 *Roll No. .....*

Odd Semester **Ph.D Coursework**

END SEMESTER EXAMINATION **NOV/DEC-2019**

HU-703 ECONOMETRICS

Time: 2:00 Hours *Max. Marks: 60*

Note: Answer all questions.

Q.1 Consider the following model:

$$Y_t = \beta_{1+} \beta_2 X_t + \beta_3 X_{t-1} + \beta_4 X_{t-2} + \beta_5 X_{t-3} + \beta_6 X_{t-4} + u_t$$

Where Y = consumption, X = Income, and t = time. The model postulates that consumption expenditure at time t is a function not only of income at time t but also income through previous periods.

(a) Would you consider multicollinearity in such models and why?

(b) If collinearity is expected, how would you resolve it?

(10x2=20Marks)

Q.2. What is the autocorrelation problem and how its presence affects the OLS estimators?

OR

Explain the method of Generalized Least Squares (GLS) to correct the problem of pure autocorrelation.

(10x2=20Marks)

Q.3. Explain the simultaneous equation bias. Consider the following modified Keynesian model of income determination:

$$C_t = \beta_{10} + \beta_{11} Y_t + u_{1t}$$

$$I_t = \beta_{2o} + X\beta_{21} Y_t + \beta_{22} Y_{t-1} + u_{2t}$$

$$Y_t = C_t + I_t + G_t$$

Where, C = consumption expenditure

I = investment expenditure

G = government expenditure

Y=income

G_t and Y_{t-1} are assumed predetermined.

(a) Obtain the reduced form equations and determine which of the preceding equations are identified (either just or over)

(b) Which method will you use to estimate the parameters of the over-identified equation and of the just (exact) identified equation? Justify your answer.

(10x2=20Marks)

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Total no. of Pages 01

Roll no.....

First Semester

PhD.

END SEMESTER EXAMINATION

November, 2019

HU-704/Criticism In Practice

Max. Marks: 70

Time: 03Hours

Answer the following questions:

1. Show your acquaintance with any two of the following: (10x2=20)
   a) Poetic Truth and Poetic Beauty in "The Study of Poetry"
   b) Concept of Time in "Tradition and Individual Talent"
   c) Character of Rabbo in "Lihaf"
   d) The significance of the title, *The Color Purple*

2. Evaluate Matthew Arnold as a classicist critic with special reference to his essay, "The Study of Poetry". (20)

OR

Present a critique of the essay, *Orientalism* by Edward Said.

3. Present the major arguments contained in Chinua Achebe's "Colonialist Criticism." (20)

OR

Comment on the idea of 'home' as reflected by in "Imaginary Homelands" by Salman Rushdie.

4. Critically evaluate Alice Walker as a feminist writer. (10)

OR

Mitro Marzani is a literary representation of assertive middle class Indian women." Comment.

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Total no. of Pages 01 Roll no,.....

First Semester Ph.D

END SEMESTER EXAMINATION November, 2019

HU-706 Retellings of Indian Myths and History

Max. Marks: 70 Time: 03Hours

Answer the following questions:

1. Write a critical note on retellings of history with special reference to the movies prescribed in your syllabus. (15)

OR

Comment on the creative significance of adaptation of history.

2. Critically evaluate the reimagining of Ahalya in the short movie, *Ahalya.* (20)

OR

"*Sita Sings the Blues* is a deflective adaptation." Comment.

3. Write a note on the role of Lord Krishna in the epic-plot of *Rashmirathi.* (20)

OR

"*Sita: The Warrior of Mithila* is a contemporization of the ancient story of Sita as contained in *The Ramayana* by Valmiki." Comment.

4. Show your acquaintance with any two of the following: (7.5x2=15)

a) Retelling as a trans creative medium
b) Myth on Screens: To be or not to be?
c) Character of Padmavat
d) Mughal-E-Azam as a historical movie

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Total No. of Pages 03 Roll No.....

FIRST SEMESTER **M.Tech. /Ph.D. (IT)**

END SEMESTER EXAMINATION ***NOV/DEC-2019***

ISY 501-Linear Algebra and Probability

Time: 3:00 Hours *Max. Marks: 40*

Note: Attempt total of *FIVE* questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Question No. 1 [4x2=8]

[a] Discuss the importance of normal distribution curve. In a test on 200 electric bulbs, it was found that the life of a particular make was normally distributed with $\mathcal{N}(2040, 60)$. Estimate the number of bulbs likely to burn for

I. More than 2150 hours,
II. Less than 1950 hours, and
III. More than 1920 hours but less than 2160 hours.

[b] A company of apparels is planning a direct mail order by sending catalogues to potential customers obtained from a mailing list. It is determined that a response of 20% would be needed to consider the campaign successful. In a pilot study involving 400 potential customers selected randomly from the mailing list, the actual number of responding was 74. Can the campaign judge be success at 95% confidence?

Question No. 2 [4x2=8]

[a] Let T: $R^2 \rightarrow R^3$ be a linear transformation given by

$$T\left(\begin{bmatrix} X_1 \\ X_2 \end{bmatrix}\right) = \begin{bmatrix} X_1 - X_2 \\ X_2 \\ X_1 + X_2 \end{bmatrix}$$

Find the orthonormal basis of the range of T.

[b] Let T be the linear transformation from the vector space R^2 to R^2 itself given by:

$$T\left(\begin{bmatrix} X_1 \\ X_2 \end{bmatrix}\right) = \begin{bmatrix} 3X_1 + X_2 \\ X_1 + X_2 \end{bmatrix}$$

I. Verify that the vectors $V_1 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ and $V_2 \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ are eigenvectors of the linear transformation T, and conclude that $B=\{v_1, v_2\}$ is a basis of R^2 consisting of eigenvectors.

II. Find the matrix of T with respect to the basis $B= \{v_1, v_2\}$.

Question No. 3 [4x2=8]

[a] Answer the following:

I. Using the definition of the range of a matrix. Describe the range of the matrix.

$$\begin{bmatrix} 2 & 4 & 1 & -5 \\ 1 & 2 & 1 & -2 \\ 1 & 2 & 0 & -3 \end{bmatrix}$$

II. Find a basis for Span(s) where $S= \{ \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 2 \\ -1 \end{bmatrix}, \begin{bmatrix} 2 \\ 6 \\ -2 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 3 \end{bmatrix} \}$

[b] Find all eigenvalues and corresponding eigenvectors for a matrix A if $A = \begin{bmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{bmatrix}$

Question No. 4 [4x2=8]

[a] What is hypothesis testing and discuss its need? An insurance agent claims that the average age of policy-holders who insure through him is less than the average for all agents, which is 30.5 years. A random sample of 100 policy holders insured through him gave the following age distribution given in table below:

Age as on last birthday	16-20	21-25	26-30	31-35	36-40
No. of persons	12	22	20	30	16

Test his claim at the 5% level on the basis of the data obtained.

[b] What is Singular value decomposition? Find the SDV of the matrix A.

$$A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

[1x8=8]

Question No. 5

Discuss the following

[a] Null and Alternative hypothesis

[b] Characteristics of a normal probability curve.

[c] Level of significance and confidence interval.

[d] Dimensionality Reduction

[e] Skewness and kurtosis

[f] Orthonormal vectors

[g] Simple random sampling

[h] Types of testing errors

[4x2=8]

Question No. 6

[a] Prove that $Q = \begin{bmatrix} cosZ & sinZ \\ -sinZ & cosZ \end{bmatrix}$ is an orthogonal matrix.

[b] Let A be a $3x3$ matrix. Suppose that A has eigenvalues 2 and -1, and suppose that u and v are eigenvectors corresponding to 2 and -1, respectively, where

$$u = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} \quad \text{and} \quad v = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}$$

Then compute $A^5 w$, where $w = \begin{bmatrix} 7 \\ 2 \\ -3 \end{bmatrix}$.

Total No. of Pages:02 Roll No.....

I[st] SEMESTER M. Tech.(ISY)

END SEMESTER EXAMINATION Nov Dec.-2019

ISY503 Data Structure and Algorithm

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer *any five* questions. Assume suitable missing data, if any.

Q.1 [A] Write an algorithm using stacks that accepts an infix string and forms an equivalent infix string will all superfluous parenthesis removed (Example in expression A+(B*C) the parenthesis surrounding B*C are superfluous and removing them will leave the expression unchanged i. e. A+B*C). [4]

[B] Explain the procedure to evaluate postfix expression. Evaluate the following postfix expression 7 3 4 + - 2 4 5 / + * 6 / 7 +? [4]

Q,2 [A] Find the run time complexity of following: [4]

(i)

```
void function(int a)
{   if (a<=1)
return;
   if (a>1)
    {
      printf ("**");
      function (a/2);
      function(a/2);
}
}
```

(ii)

```
function (int n )
{
  int i=1;
  while (i<n)
  {
    J=n;
    While (j>0)
     { j=j/2; }
      i= 2*1;
  }
}
```

(iii) $T(n)= 2T(\sqrt{n}) + \log n$

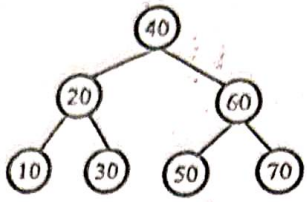
(iv)

$$T(n) = \begin{cases} 2T(n-1) - 1, & \text{if } n > 0. \\ 1, & \text{otherwise} \end{cases}$$

[B] Write an algorithm to implement the Heap sort and verify it with a suitable example. [4]

Q.3 [A] What are the advantages of circular linked list over single linked list? Write an algorithm to convert a sorted doubly linked list to a balanced binary search tree for example sorted doubly linked as 10, 20, 30, 40 50, 60, 70 then

their balanced binary search tree will be: [5]



[B] Write an algorithm to implement doubly linked list. [3]

Q.4 [A] Write the difference between Stack and Queue. Write the algorithm to perform all the operations in the circular queue. [4]

[B] How many different binary trees are possible with n nodes? Explain with the suitable example. [2]

[C] Write the Applications of priority queue. [2]

Q.5 [A] Write an algorithm for printing all the ancestors of a node in a binary tree. Also, find the time complexity of your algorithm. [4]

[B] Write a recursive function to remove all the leave nodes of a given binary tree. [4]

Q. 6 [A] Write an algorithm to find the Hamiltonian path in the given Directed Acyclic Graph (DAG's). [3]

[B] For a given graph G with n vertices how many trees we can construct? Verify it with suitable example. [2]

[C] What are the advantages of Dynamic programming? Given a chain of four matrices A1, A2, A3, and A4 with P0=5, P1=4, P2=6, Pp3=2 and P4=7. Find the value of m[1, 4] using dynamic programming approach. [3]

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Ist SEMESTER M.TECH. [ISY]

END-SEMESTER EXAMINATION (Nov/Dec - 2019)

ISY5301 ARTIFICIAL INTELLIGENCE

Time: 3 Hours **Max. Marks: 50**

Q.1) Answer all the following questions:

(a) Discuss the experimental set-up and findings of Turing-test and Chinese room argument. [2]

(b) Differentiate shallow and deep pruning in game trees with suitable example. [2]

(c) Draw AND-OR graph to solve the multiplication problem of 4 matrices($A_1A_2A_3A_4$). [2]

(d) Discuss bagging and boosting methods of ensemble learning. [2]

(e) What is the usefulness of word embeddings in deep learning architectures? [2]

Q.2) Attempt any two questions out of the following:

(a) Differentiate supervised, unsupervised and reinforcement learning methods by taking suitable examples. [5]

(b) Explain with the help of an architecture diagram word2vec approach of prediction-based embedding. [5]

(c) What is the concept of zero sum games ? Discuss in terms of min-max search trees. [5]

Q.3) Attempt any two questions out of the following:

(a) Explain different functions that can be used as activation functions in Neural Networks. [5]

(b) What is the difference between neural network and deep neural network? [5]

(c) Explain backward error propagation and weight adjustments in neural networks. [5]

Q.4) Attempt any two questions out of the following:

(a)Explain focused wave-front algorithm for robot path planning in static obstacle environment. [5]

(b) What are the advantages and disadvantages of market-based approach of task allocation? Explain different rules for keeping and selling a bid to obtain optimal assignment. [5]

(c) Differentiate correlation, covariance and convolution. [5]

Q.5) Attempt any two questions out of the following:

(a) Term Frequency (TF) and Term Frequency-Inverted Document Frequency (TF-IDF) are the two methods in NLP to figure out the similarity between documents. Derive the expression to calculate TF and TF-IDF along with salient features of each one of them. [5]

(b) Consider an example where four jobs (J1, J2, J3, and J4) need to be executed by four workers (W1, W2, W3, and W4), one job per worker. The matrix below shows the cost of assigning a certain worker to a certain job. The objective is to minimize the total cost of the assignment. Find out the optimal assignment by using Hungarian algorithm. [5]

	J1	J2	J3	J4
W1	82	83	69	92
W2	77	37	49	92
W3	11	69	5	86
W4	8	9	98	23

(c) Use the k-means algorithm and Euclidean distance to cluster the following 8 points into 3 clusters: A1=(2,10), A2=(2,5), A3=(8,4), A4=(5,8), A5=(7,5), A6=(6,4), A7=(1,2), A8=(4,9). [5]

Total No. of Pages: 02 Roll No_____

FIRST SEMESTER M.Tech. (ISY)

END SEMESTER EXAMINATION NOV./DEC.-2019

ISY-5409 IMAGE ANALYSIS

Time: 03 Hours *Max. Marks: 40*

Note: Attempt any *FIVE* questions.
Assume suitable missing data, if any.

Question No. 1 [4x2=8]

Consider a colour image of size 1024×1024. If this image is transmitted to a WI-FI channel of 25Mbps. Determine the transmission time required to transmit the following images:

[a] The original image is converted into a gray scale image of size half of the original image.

[b] Gray scale image is converted into a binary image of size half of the gray scale image.

Question No. 2 [4x2=8]

[a] Demonstrate with the help of example that the effect of noise can be minimized using median filter.

[b] Consider the image $f(x,y)$ having gray values between 0 to 15. Perform the image stretching of the gray value uniformly and linearly within the entire image.

$$f(x,y) = \begin{bmatrix} 10 & 11 & 12 & 11 & 10 \\ 12 & 12 & 13 & 5 & 4 \\ 13 & 12 & 5 & 3 & 5 \\ 13 & 12 & 4 & 3 & 5 \\ 12 & 4 & 5 & 4 & 4 \end{bmatrix}.$$

Question No. 3 [4x2=8]

[a] Write down the steps involved in Histogram equalization and also discuss the low and high contrast images.

[b] Perform the histogram matching operation on the 8×8 image with the following histogram:

Grey levels (r_k)	0	1	2	3	4	5	6	7
No. of pixels	8	10	10	2	12	16	4	2

The *target histogram* of the image:

Grey levels (r_k)	0	1	2	3	4	5	6	7
No. of pixels	0	0	0	0	20	20	16	8

Question No.4 [4x2=8]

[a] Compute the median value of the marked pixels in image shown below using a 3 × 3 Mask:

18	22	33	25	32	24
34	(128)	(24)	(172)	26	23
22	19	32	31	28	26

[b] What are the various steps involved in frequency domain filtering? Explain with the help of suitable diagram.

Question No.5 [4x2=8]

Consider a digital image $f(x,y) = \begin{bmatrix} 6 & 7 & 3 \\ 5 & 2 & 4 \\ 1 & 2 & 3 \end{bmatrix}$, in this image the last bit plane is removed. Do the followings:

[a] Represent the image after removing the plane.

[b] Compare the original histogram of image with histogram of removed plane image.

Question No.6 [4x2=8]

A sampled image $I(m,n)$ is distorted by convolution with either space invariant point functions h_1 or the function h_2 where, $h_1 = \delta(m,n) + \delta(m-1,n) + \delta(m+1,n) + \delta(m,n-1) + \delta(m,n+1)$ and $h_2 = 5\delta(m,n) + \delta(m-1,n) + \delta(m+1,n) + \delta(m,n-1) + \delta(m,n+1)$, what are the optical transfer functions of these two convolving functions? Assume that distorted image also contains random additive noise then in one image, the distortion can be effectively removed using an inverse filter, while the other required the pseudo-inverse filter. Which image must use pseudo inverse filtering and why?

Total No. of Pages 1 Roll No.....

THIRD SEMESTER M.Tech. (I.T.)

END SEMESTER EXAMINATION (November-2019)

IT-7013 SOFT COMPUTING

Time: 3 Hour Max. Marks: 100

Note: Attempt any five questions. Question1 is compulsory. Assume suitable missing data, if any.

Q1. Answer the following in brief: [4*5=20]

i. What is alpha (α) cut in fuzzy set.
ii. Explain Operations of Interval.
iii. Design Voice Recognition system using Neural Network.
iv. Design survey form to capture human vagueness.

Q2. [15]

a. Define Trapezoidal fuzzy number. There are two intervals A=[3, 5] and B =[-2,7]. Find

$A(+)B$ $A(/)B$
$A(-)B$ B^{-1}
$A(\bullet)B$

b. Differentiate between Neuron and Artificial Neuron [5]

Q3.

a. Explain waggle danee of honey bee. [10]
b. Design a scenario to between Exploration and Exploitation for ABC Algorithm. [10]

Q4.

a. Explain feed forward Networks and Elman Networks. [10]
b. Consider two triangular fuzzy numbers $A=(-4,2,4), B=(-1,0,6)$. Solve the following. [10]

i. $A(+)B$
ii. $A(-)B$
iii. $A(\bullet)B$

Q5. Explain Selection Mechanisms and Representation in Genetic Algorithms and describe Traveling Salesman Problem (TSP). [20]

Q6.

a. Explain how particles adjust their positions in swarm optimization? Modify PSO Algorithm for better exploitation [10]
b. Explain Stopping Criteria of an ant and write Ant Colony Optimization Algorithm [10]

Total No. of Pages: 2 Roll No.....

III SEMESTER **M.TECH. [ISY]**

END SEMESTER EXAMINATION **(NOV/DEC - 2019)**

IT-7023 CYBER FORENSICS AND CYBER CRIME INVESTIGATION

Time: 3:00 Hours **Max. Marks: 100**

Note: Question one is compulsory.
Answer any four questions from Questions 2-7.
Assume suitable missing data, if any.

1) Describe in approx. 400 words any one of the below, using tables figures and process/data flow diagrams. (20)
   a) Disk Forensics
   b) Network Forensics
   c) Wireless Forensics
   d) Memory Forensics
   e) Malware Forensics
   f) Database Forensics
   g) Mobile Forensics
   h) Image Forensics

2)
   a) Classify cyber crime. By necessity, the fight against cybercrime must involve more than just the police. Discuss the role of each of the following in the fight against cybercrime and how they should be trained for it:- (10)
      i) Legislators
      ii) The IT community and the community at large
      iii) The law enforcement
      iv) Jurors
      v) Courts
      vi) The corrections system
   b) Discuss Criminal Profiling in detail. (10)

3)

a) What are the offences under Indian IT Act 2000? Discuss salient features of IT Act 2000. (10)

b) Give an overview of the changes made to the India IT Act in 2008. How did it impact Information Technology organizations? (10)

4)

a) What precautions should be taken while collecting electronic evidence? What are the things to be avoided during a forensic examination? Give examples. (10)

b) Explain some Forensic Examination Standards. Discuss preservation of volatile digital evidence. (10)

5)

a) Discuss Policies and Procedures development. Also discuss how policy violations should be handled. (10)

b) Discuss the "Computer Investigation process", focusing on investigation of a computer machine. (10)

6)

a) Discuss Disk Imaging, and tools used for the same. (10)

b) Discuss five hardware and five software forensics tools. (10)

7)

a) Discuss searching and seizing Digital Evidence (10)

b) Documenting evidence is an important part of a cyber forensic investigation process. Discuss with respect to chain of Custody, evidence logs, documenting evidence analysis (10)

END

Total no. of pages: 2 Roll No.....

FIRST SEMESTER M. Tech. [PIE]

END SEMESTER EXAMINATION NOV/DEC- 2019

PRD -501 –Theory of Metal Cutting

Time: 3hrs. Max. Marks: 40

Note: All questions carry equal marks.
Assume suitable missing data, if any.

Q1a). State Lee and Shaffer's solution of orthogonal cutting. Explain idealized distribution of stresses on the rake face of a single cutting tool. (4 Marks)

Q1b). Determine shear angle in controlled contact orthogonal cutting. (4 Marks)

Q2a). Show the force components during horizontal surface grinding. Derive the relationship of chips produced in horizontal surface grinding. (4 Marks)

Q2b). Prove velocity relationship in oblique cutting is function of (i) normal rake angle (α_n), (ii) Angle of obliquity (I) and (iii) Chip flow angle (ψ). (4 Marks)

OR

Q2a)". In turning operation, explain how surface roughness depends on feed rate and cutting speed. Show the peak to valley roughness can be expressed as (4 Marks)

$$h = f\tan\gamma_\varepsilon + \frac{r}{2}\tan^2\gamma_\varepsilon - \sqrt{(2fr\tan^3\gamma_\varepsilon}$$

Q2b)". Describe how mode-coupling effect caused machining vibration. Describe the means of avoiding chatter on an existing machine. (4 Marks)

P.T.O

Q3a). Prove that the chip thickness t is the most important variable affecting the surface finish in grinding process and given by: $h = \frac{t^2}{16d}$, where h is mean peak to valley height. (4 Marks)

Q3b). In a conventional twist drill, the point and helix angles are 210^o and 30^o, respectively. If the chisel edge diameter is 4 mm and the drill diameter is 25 mm, calculate the minimum and maximum normal rake angle at the lips. (4 Marks)

OR

Q3a)". Calculate the average shear plane and rake face temperatures during orthogonal cutting with a zero rake tool where V= 2m/sec, b = 2 mm and t = 0.2 mm. the chip thickness ratio and chip-tool contact length obtained at these conditions were 0.2 and 0.45 mm respectively. The dynamometer measurement gave tangent force =760N and normal force = 390N. (4 Marks)

Given: $\rho = 7200$ Kg/m^3 , c = 502 J/Kg °C , K = 50 W/m °C , $\Theta_o = 25$ °C, $\beta = 0.85$

Q3b)". Discuss the causes of self- excited vibration in machine cutting process. (4 Marks)

Q4a). Derive equation for Flank wear and Crater wear in the single cutting tool. (4 Marks)

Q4b). What are effect of helix angle on force fluctuations on plain milling? Derive the relationship of mean underformed chip-thickness in plain milling. (4 Marks)

Q5. Write short notes on ANY FOUR of the following: (8 Marks)

a) Rake angles in oblique cutting
b) Oxely method for shear angle in orthogonal cutting
c) Effect of friction angle and rake angle on natural contact
d) Stick –Slip motion
e) Accelerated Tool life Test (Tapering Turning)

-END-

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M.Tech./Ph.D (PRD) FIRST SEMESTER

END SEMESTER EXAMINATION (November-2019)

PRD 503

~~PIE-503~~ WELDING PROCESSES AND METALLURGY

Time: 3:00 Hours *Maximum Marks : 40*

Note : Answer any *FIVE* questions.
Assume suitable missing data, if any.

1[a] Discuss the adverse effects of residual stresses and distortion on the service performance of the structure. How would you as a practicing welding engineer plan the analysis of residual stresses and distortion in order to get the reliable welded structure? Explain with the help of a flow chart. 4

[b] What is an inverter power source? At what duty cycle can a 200 amperes power supply rated at 60% duty cycle be operated at 250 amperes output? If the same power supply is to be operated continuously, what would be maximum output current? 4

2[a] Explain the type of electrode with the BIS code of ERR4326H_3JX 4

[b] Under what conditions does spray mode of metal transfer occur. What is an electromagnetic pinch force? 4

3[a] What is the feature that distinguishes FCAW process from other welding process? Mention the advantages and applications of Gas metal arc welding process. 4

[b] Describe the different types of lasers that are generally found in Laser beam welding process. 4

4[a] Why is the maintenance of a stable arc important? Name the different ways of arc maintenance in GTAW process. What is Self re-ignition? 4

[b] Differentiate between plasma arc welding and gas tungsten arc welding. What metals can be welded with plasma arc welding? 4

5[a] Find the best welding speed to be used for the welding of 6mm steel plates with an ambient temperatures of 30°C with the welding transformer set at 25V and current passing is 300 A. The arc efficiency is 0.9 and possible travel speeds are 6 to 9 mm/s. The limiting cooling rate for satisfactory performance is 6° C/s at a temperature of 550°C. Assume thermal conductivity of the metal = 0.028 J/mm-s°C Volumetric specific heat = 0.0044J/mm^3°C. 4

[b] State the welding characteristics of copper and its alloys. 4

6[a] Explain with the help of figure the relation between the peak temperatures experienced by various regions in a weld and how these correlate with the iron-carbon phase diagram. 4

[b] A magnetic particle method may be used for detecting defects in a welded joint: 4

(i) Outline the principle of this method.

(ii) What type of defects may be revealed?

7 Write short notes on any TWO of the following: 8

[a] Eutectic, eutectoid and peritectic reactions

[b] Welding defects

[c] Effect of welding speed on weld pool shape

Total No. of Pages-02 *Roll No.....*

FIRST SEMESTER **M. Tech.(PRD)**

END SEMESTER EXAMINATION **Nov/Dec-2019**

PIE/ **PRD-5301 PRINCIPLES OF MACHINE TOOLS**

Time: 3:00 Hours **Max Marks: 50**

Note: Answer any FIVE questions.

1	(a) What is the use of gear box in machine tools? Draw the gear box diagram of lathe machine.	5
	(b) How do you classify the different machine tools based on relative motions to generate various surfaces (explain with suitable block diagram)?	5
2	(a) Discuss different types of cross sections of bed used in machine tools. What are the properties of material used in bed?	5
	(b) Name different types of bearing. Explain the use of ball bearing with an example.	5
3	(a) Explain the effect of vibrations on machine tool.	5
	(b) What are the requirements of spindle? How you can calculate the deflection due to bending of the spindle?	5
4	(a) What are the advantages and limitations of transfer machines?	5
	(b) Name different types of stepless speeds methods. Explain any one method.	5
5	(a) How dynamic performance tests for lathes are done?	5
	(b) Discuss the function of guide ways/slide ways used in machine tools. Explain different types of guide ways/slide ways.	5

6 Write short notes on any four of the following: 10

(a) N. C. machine
(b) D. N. C. machine
(c) Transfer machine
(d) C. N. C. machine
(e) Quick return mechanism in machine tool

Total No. of Pages 2 Roll No.....

I SEMESTER M.Tech_Prod. Engg.

END SEMESTER EXAMINATION NOV/DEC-2019

PAPER CODE PRD-5401 CAD&CAM

Time: 3:00 Hours Max. Marks: 40

Note : Answer all question by Selecting any two parts from each question.
All questions carry equal marks.
Assume suitable missing data, if any.

Q. 1Discuss following with suitable examples & neat sketches

[a] NC, CNC & Types of Control Systems used, DNC & Buffer Storage

[b] Canned Cycles & its benefits. Linear, Parabolic & Circular interpolation with advantages and limitations.

[c] Adaptive control, Open loop & Close Loop Systems [8]

Q.2[a] Discuss various types of Programming with Suitable examples

[b] Elaborate G codes & M Codes with 10 examples of each

[c] Write an 'APT' Programme to machine a cylindrical component . on CNC lathe. Total length of component is 450mm and diameters are 20mm, 40mm, 60mm at an equidistant of 150mm. Material of component is mild steel. Machining is to be done in two passes. [8]

Q.3[a] Discuss an industrial robot with neat sketch and write its application in industries. Also enlist its limitations.

[b] Discuss various types of sensors used in robots.

[c] Elaborate various types of configurations of robots with neat sketches. [8]

Q.4[a] Discuss Flexible Manufacturing Cells and Systems with their basic elements.

[b] Explain an advanced control cycle used in FMS with neat sketch.

[c] What is Flexibility? Discuss its types with Suitable examples. [8]

Q.5[a] Define Group Technology w.r.t. CAD/CAM. What are its advantages & limitations? Discuss Precision, Resolution and Accuracy with examples.

[b] Discuss computer aided design with typical software and hardware used in industries for CAD. Also enlist various steps undertaken in CAD.

[c] Discuss in details Computer Aided Process Planning and its various types. How CAPP related to CAD and CAM? Also elaborate the advantages and limitations of CAPP. [8]

Total No. of Pages _3

FIRST SEMESTER

Roll No. .....

M.Tech (ME)

END SEMESTER EXAMINATION Nov -2019

ME551 & Plasticity and Metal Forming

Time: 3:00 Hours

Max. Marks : 100

Note : Answer any five questions.
All questions carry equal marks. Assume suitable missing data, if any.

Q.1 [a]. What is meant by the yield criterion of a metal? State Von Mises and Tresca yield criteria. If Von Mises and Tresca criteria are assumed to agree for the case of Uniaxial tensile test, show that it will agree for the case of pure shear and the Von Mises circle will circumscribe the Tresca hexagon. [10]

[b]. Derive anisotropic yield criterion proposed by Hills and show that the yield locus can be written as:

$$[\sigma_o{}^2 = \sigma_1{}^2 + \sigma_2{}^2 - \frac{2R}{1+R}\sigma_1\,\sigma_2]$$

Where σ_1 and σ_2 are the principal stresses and R is anisotropy ratio. [10]

Q.2 [a]. Show that at the point of necking true uniform elongation is equal to strain hardening exponent for a material obeying power law of hardening. Also show graphically and write the equations for following stress strain relations:-

(i) Rigid perfectly plastic solid.

(ii) Elastic perfectly plastic solid.

(iii) Elastic work hardening material

(iv) Rigid work hardening material [10]

[b]. An aluminium thin walled tube (radius/thickness = 20) is closed at both ends and pressurized to 10 MPa to cause plastic deformation.

Determine plastic strain in circumferential direction of tube, if aluminium follows the law:[$\bar{\sigma} = 176(\bar{\epsilon})^{0.22}$]MPa. [10]

Q.3[a] A cylindrical bar of diameter d and height h is compressed in between two flat dies. Derive the expression for die pressure and total die load taking coulomb's friction conditions considering both the cases of sticking and sliding friction. [10]

[b] An annealed steel block of 100mm height and 50mm diameter is forged at 380°C between flat dies to 70% of its original height. The uniaxial flow stress of the material at 380°C is given by [$\sigma_o = 480\ \epsilon^{0.25}$] MPa. Calculate the forging load required if $\mu = 0.3$. [10]

Q.4[a] Explain the effects of following on the mill load during rolling:-

(i) Roll diameter, (ii) Percentage reduction, (iii) Coefficient of friction and (iv) Back and front tension [08]

[b] Using the assumption of plane strain condition in strip rolling derive an expression for the position of the neutral plane. [12]

Q.5[a] Neglecting friction, derive an expression for draw stress in a wire drawing operation to achieve reduction in area. Also, show that maximum possible reduction in area is 63%. [10]

[b] Fire extinguishers of 60 mm height and uniform wall thickness are made by impact extrusion from aluminium (K=140 MPa , n=0.23) billets of 120mm diameter using a punch of 105 mm diameter. If the extrusion pressure is given by $p_e = \sigma_{avg}$ (0.8+1.5 ln R) and 100 parts are required per minute, calculate the billet height, punch force and average power required. [10]

Q.6[a] What is forming limit diagram? Explain the formability of a sheet metal with reference to:

(i) Strain hardening coefficient
(ii) Normal and planar anisotropy
(iii) Yield strength
(iv) Grain size

[10]

[b] The table lists properties of a AISI1010 steel of thickness 1.4 mm.

E(GPa)	Poisson's ratio	Yield Strength (MPa)	UTS(MPa)	Elongation%	R_0	R_{45}	R_{90}
207	0.32	327	428	20%	1.6	1.2	1.85

(i) Determine whether a cup of diameter 50 mm and 40 mm height can be drawn in a single stage, if the efficiency of the process is 85%.

(ii) Determine the maximum draw force in deep drawing.

(iii) If a 25 mm wide strip of above sheet is to be bent into V- shape with maximum possible radius of curvature, find out the required punch angle considering spring back. [10]

Q.7. Discuss the causes and remedy of following defects in details

(i) Forging defects

(ii) Rolling defects [10x2]

END

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Total No. of Pages-02 *Roll No*.....

THIRD SEMESTER **M. Tech.(PIE)**

END SEMESTER EXAMINATION **Nov/Dec-2019**

ME-552 PRINCIPLES OF MACHINE TOOLS

Time: 3:00 Hours **Max Marks: 100**

Note: Answer any FIVE questions.

1 (a) What is the use of gear box in machine tools? Draw the gear box diagram of lathe machine. 10

(b) How do you classify the different machine tools based on relative motions to generate various surfaces (explain with suitable block diagram)? 10

2 (a) Discuss different types of cross sections of bed used in machine tools. What are the properties of material used in bed? 10

(b) Name different types of bearing. Explain the use of ball bearing with an example. 10

3 (a) Explain the effect of vibrations on machine tool. 10

(b) What are the requirements of spindle? How you can calculate the deflection due to bending of the spindle? 10

4 (a) What are the advantages and limitations of transfer machines? 10

(b) Name different types of stepless speeds methods. Explain any one method. 10

5 (a) How dynamic performance tests for lathes are done? 10

(b) Discuss the function of guide ways/slide ways used in machine tools. Explain different types of guide ways/slide ways. 10

6 Write short notes on any four of the following: 20

(a) N. C. machine

(b) D. N. C. machine

(c) Transfer machine

(d) C. N. C. machine

(e) Quick return mechanism in machine tool

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Total no. of pages :2 *Roll No.*_____

M.Tech (PIE) 3rd SEMESTER

END SEMESTER EXAMINATION (Nov 2019)

ME-7012 COMPUTER AIDED MANUFACTURING

Time : 180 mins. Max. Marks: 100

Note: *Question No.1 is compulsory*. Attempt any FOUR full questions from the remaining. Assume missing data , if any

1. Write short notes on.
(a) Lean Manufacturing
(b) Axis system of CNC machines
(c) AGV and material handling system used in FMS
(d) Production Flow Analysis in GT -20-

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2. (a) Explain with example (i) Circular Interpolation (ii) Linear Interpolation. -08-
(b) With neat sketches explain the working of Optical tape reader -04-
(c) With example explain Absolute programming and Incremental programming CNC system -08-

3.(a)) Explain (i) unidirectional and bidirectional approaches in CNC system (ii)) ball type lead screw used CNC machines. -10-

OR

Explain 6 d.o.f. of arm and body motions of a robot. With neat sketch explain Cylindrical Coordinate robot. -10-

(b) Explain with examples (i) Coordinate words (ii) Preparatory words (iii)Miscellaneous words (iv) Tool and Feed words used in NC part programming? -10-

4.(a) Explain the following functions (two types in each case) of APT part programming language using examples (i) LINE (ii) POINT (iii) CIRCLE (iv) PLANE. -10-

(b) Write a note on Variant approach and Generative approach in CAPP. Also explain architecture of a CAPP system with block diagram. -10-

5. (a) Explain with sketches (i) conventional job shop layout (ii) functional grouping layout as per product requirements adopted in Group Technology -10-

(b) Explain with example the following coding systems used in Group Technology (i) Hierarchical or monocode (ii) Hybrid or mixed systems. -10-

6. (a) With diagram explain Flexible manufacturing System with In-line layout, loop layout, Ladder layout and Open field layout. -10-

(b) Explain the in detail the integration of all the functions of an enterprise of CIM depicted through wheel diagram as proposed by SME. -10-

Total No. of pages 2 Roll No. .....

THIRD SEMESTER M. TECH(PE)

MID SEMESTER EXAMINATION NOV/DEC 2019

ME-7022 MANAGERIAL CONCEPTS & ORGANIZATIONAL BEHAVIOR

Time 3 Hours **Max. Marks: 100**

Note:	Assume suitable missing data, if any Question No. 6 is compulsory, Answer any FOUR questions from remaining

1. (a) What do you understand by the term 'Manager' Discuss the main functions of a manager in modern business organization? (10)
(b) What is the true field of management? Discuss the main functions of a manager in modern business organization. (10)

2. (a) Define motivation. Explain the important steps in motivation. Write about Indian thought on motivation. (10)
(b) What is knowledge management? Describe the functions that communication provides within a group or organization. Give an example each. (10)

3. (a) How could a manager stimulate conflict in his or her department? What personality characteristics and traits a manger should possess to be effective? (10)
(b) What is meant by decision making by group? Under what conditions decision making by group is considered superior to decision making by individuals? (10)

4. (a) What is meant by leadership style. "Wipro Limited is one of the world's top providers of software consulting from applications, development to maintenance." How did Azim Premji build one of the biggest IT companies in India? What leadership skills he helps him reach where is today? (10)
(b) Briefly explain the significance of the following principles of management. (i) Unity of command (ii) Unity of direction (iii) Scalar chain (iv) Authority and responsibility (10)

5. (a) Define organizational behavior as a field of study. What are its main features? How does it differ from organization theory and behavioral science? (10)

(b) Discuss about corporate social responsibility of an Indian companies. (10)

6. Read the following case study and answer the following questions. (20)

What lures 40 million customers to visit Starbucks each week? Customers will pay a higher price for a cup of coffee, compared with that in local establishments; because Starbucks delivers consistent product and service quality to give customers a "Starbucks Experience" that is inimitable in the industry. The ability to set a new benchmark in product quality and customer service has been the cornerstone of its business. Starbucks's excellent global reputation developed from management belief in human capital and in treating employees as the company's greatest asset. Jim Donald, CEO and president of Starbucks, believes that human resources should attend every strategic discussion concerning the company. By aligning human resources management and delivering word-class customer service to customers. Employees at Starbucks are expected to cooperate and work together to meet the demands of their customers. Starbucks attracts and retained the best and the brightest in the industry due to the high level of satisfaction that employees receive while on the job. To increase employee's passion to deliver high level of customer service. Starbucks offers a multitude of training options to employees so they may become coffee masters. Starbucks has created a competitive advantage by creating a workforce that is very knowledgeable and passionate about what it does.

(a) Do you believe that Starbucks's corporate culture has given the organization a competitive in the industry? Explain

(b) What makes Starbucks more desirable to work than other coffee shops? Would you prefer to work at Starbucks? Why or not? Discuss.

Total No. of Pages 02 *Roll No. .....*

FIRST SEMESTER Ph.D./M.Tech.[Computational Design]

END SEMESTER EXAMINATION NOV/DEC-*2019*

CDN-501 System Modeling Simulation and Analysis

Time: 3 Hours *Max. Marks: 50*

Note: Answer **Any Five** questions. Assume suitable missing data, if any.

1. (a) What do you understand by Discrete event simulation? The probability distribution of the daily demand of a product is given in table. The minimum demand is 102 units and maximum demand is 109 units. Simulate 10 demand values and estimate the average of the daily demand by self generating 10 uniformly distributed random numbers. (1+4)

S.No.	1	2	3	4	5	6	7	8
Demand (X_i)	102	103	104	105	106	107	108	109
Probability $p(X_i)$	0.05	0.11	0.18	0.20	0.24	0.10	0.07	0.05

(b) Distinguish between: (5)

(i) Analog and hybrid simulations

(ii) Probabilistic and Deterministic Models

2. (a) Discuss in detail the role of simulation in model validation and verification and studies with some real examples. (5)

(b) Discuss the concept of causality in bond graph modeling. How casualty is being assigned to all elements of bond graph modeling? Explain in detail. (5)

3. (a) Create bondgraph model for the system shown in Fig.1. Causal the bondgraph model and generate the system equations in state space form. (5)

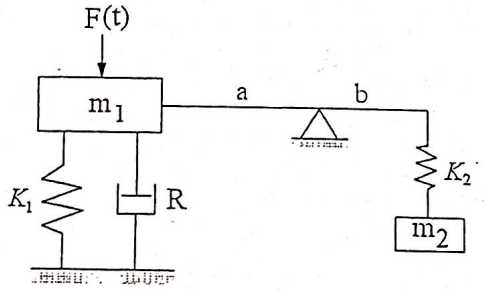

Fig.1

(b) The following table shows that a result of a study by the United Nations (*New York Times*, November 17, 1995) which has found that world population growth is slowing. It indicates the year in which world population has reached a given value: (5)

Years	1927	1960	1974	1987	1999	2011	2025	2041
Billions	2	3	4	5	6	7	8	9

Construct the scatter plot of the data and yield the logistic function.

4. (a) Sixty rabbits are introduced onto a small uninhabited island. They have no predators, and food is plentiful on the island, so the population grows exponentially, increasing by 60% each year. (5)

(i) Find a function P that models the rabbit population after x years.

(ii) How many rabbits are there after 8 years?

(b) Vehicles pass through a toll gate at a rate of 90 per hour. The average time to pass through the gate is 36 s. There is a complaint that the vehicles wait (5)

for long duration. The authorities are willing to install one more gate to reduce the average time to pass through the toll gate to 30 s if the idle time of the toll gate is less than 10% after the installation of the second gate and the current average queue length at the gate is more than 5 vehicles. Check whether the installation of the second gate is justified.

5 Create bondgraph model for the system shown in Fig.2. Causal the bondgraph model and generate the system equations in state space form. (10)

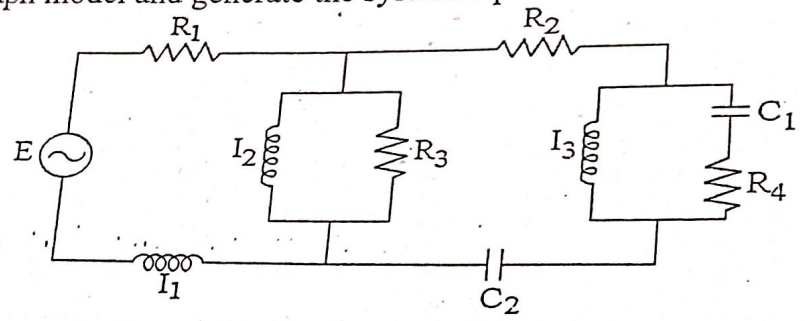

Fig.2

6. Write short notes on following: (10)

(i) Activated and field bond graph
(ii) Random variate of Poisson distribution
(iii) Simulation software packages
(iv) Numerical computational techniques

Total No of Pages...Two..... Roll No.....

Third Semester M Tech [Mech. Engg. (CDN)]

End Semester Examination *(Nov/Dec-2019)*

ME-7221 Mechatronic System Design

Paper Code Title of the Subject

Time: 03 Hrs. Max Marks. 50

Note : In total attempt Five Questions.
Question No. 1 is Compulsory.
Attempt four Questions more from the rest of the Question Paper.
Assume missing data, if any.

Q No 1 Differentiate between. (4x5=20)

(a) – Response time and Time constant.

(b) – SR Flip flop and JK Flip flop

(c) – Pulse Amplitude Modulation and Pulse Width Modulation

(d) – High Pass and Low Pass Filters

(e) – ADC and DAC

Q No 2(a) What kind of Data presentation Elements are used in Mechatronic systems? Mention in brief. (10)

Q No 2(b) What is System Modelling? Also, evolve equations for some First order and Second order systems. (10)

Q No 3(a) What is Signal Conditioning? Also mention various Analog Signal conditioning units in brief. (10)

Q No 3(b) What are different type of motors used in Electrical Actuation system? Mention their principle of operation and applications in brief. (10)

Q No 4(a) Describe various types of Hydraulic and Pneumatic actuation systems in brief. (10)

Q No 4(b) What do you understand by Fault Diagnosis of Mechatronic systems? Discuss the types of Fault Diagnosis with examples. (10)

Q No 5(a) What are different types of Feedback devices used with Mechatronic systems? Describe in brief. (10)

Q No 5(b) Explaining the principle and application of Stepper Motor, also discuss the Specifications of it. (10)

Q No 6(a) What is MEMS? What is the distinction of MEMS, in domain of Mechatronic systems? Explain in brief with Example. (10)

Q No 6(b) What is the role of Micromachining in the fabrication of microelectromechanical devices? Also discuss its types in brief. (10)

Q No 7(a) Discuss about the Advanced trends in Mechatronics systems in brief. (10)

Q No 7(b) What is Mechatronic system Design? Explain with some Case study of a Mechatronic system in brief. (10)

Q No 8 Write short note on any Four of the following. (4x5=20)

(a) – Data Acquisition system (b) – PID Controllers

(c) – Servomechanisms (d) – Valve symbols and operations

(e) – Sequential Logic (f) – PLC

Total no. of pages: 2 *Roll No.*_____

Third Semester **M.Tech. [CDN]**

End Semester Examination *Nov./Dec.- 2019*

ME-7021/ME-7311 Computational Methods for Fluid Dynamics

Time: 3:00 Hour *Max. Marks: 100*

Note: Answer all question by Selecting any two parts from each question. All questions carry equal marks. Drawn neat diagram wherever necessary. Assume suitable missing data, if any.

1 [A] Discuss the advantages and limitations of CFD with respect to experimental methods. **[10]**

[B] Derive the continuity equation in partial differential nonconservation form. **[10]**

[C] Drive Energy equation for viscous flow in partial differential conservation form. **[10]**

2 [A] Write down the parabolic partial differential equations as applicable to CFD. Discuss its mathematical behavior and its impact on CFD. **[10]**

[B] Write down the elliptic partial differential equations as applicable to CFD. Discuss its mathematical behavior and its impact on CFD. **[10]**

[C] Show that second order wave equation **[10]**

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$

Is a hyperbolic equation. Where symbols have their usual meaning.

3 [A] Using Taylor series, drive an expression for second order central mixed difference with respect to y. **[10]**

[B] Explain discretization error, round-off error, and truncation error in detail. [10]

[C] Consider the function $\emptyset(x,y) = e^x + e^y$, consider the point (x,y) = (1,1), and use second order central difference, with $\Delta x = \Delta y = 0.1$. Calculate approximate value for $(\partial\emptyset)/\partial x$ and $(\partial\emptyset)/\partial y$ at point (1,1). [10]

4 [A] Explain explicit equation solving approach in detail and explain its advantages and disadvantages. [10]

[B] List out differences between finite element and finite difference methods. [10]

[C] What is difference between initial value and boundary value problem? [10]

5 Write short note on any four of the following: [20]

(i) Iterative method.
(ii) Matrix inversion method.
(iii) Galerkin and Least square method.
(iv) Fast Fourier transform method.
(v) Variable time step method.
(vi) First order and second order upwind scheme.

Delhi Technological University

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M.Tech. (Thermal Engineering)	I Semester
Subject: Thermodynamics & Gas Dynamics	Paper: THE-501
End Semester Examination	November 2019
Time Permitted : 3 hrs	Maximum Marks : 100

Note: Attempt any Five questions. Attempt all parts of a question at one place and don't mix them with answers of other questions. Start the answer of a new question or part thereof on a new page. For air, C_p=1.005kJ/kg-K and γ =1.4 if not mentioned. Assume suitably missing data, if any. Use of Generalized property charts, Gas Tables and Steam Tables is permitted.

1(a)	A system consisting of 1 kg of air at 6 bar pressure and 0.03 m^3 volume executes a cyclic process comprising the following three distinct operations : (i) Reversible expansion to 0.09 m^3 volume, 1.5 bar pressure, presuming pressure to be a linear function of volume (p = a + bV), (ii) Reversible cooling at constant pressure and (iii) Reversible hyperbolic compression according to law pV = constant. This brings the gas back to initial conditions. (i) Sketch the cycle on p-V and T-S diagram. (ii) Calculate the work done in each process starting whether it is done on or by the system and evaluate the net cyclic work and heat transfer. **(10 marks)**
1(b)	The internal energy of air is given, at ordinary temperatures, by $u = u_0 + 0.718t$ where u is in kJ/kg, u_0 is any arbitrary value of u at 0°C, kJ/kg and t is temperature in °C. Also for air, $pv = 0.287\ (t + 273)$, where p is in kPa and v is in m3/kg. (*i*) An evacuated bottle is fitted with a valve through which air from the atmosphere, at 760 mm Hg and 25°C, is allowed to flow slowly to fill the bottle. If no heat is transferred to or from the air in the bottle, what will its temperature be when the pressure in the bottle reaches 760 mm Hg ? (*ii*) If the bottle initially contains 0.03 m^3 of air at 400 mm Hg and 25°C, what will the temperature be when the pressure in the bottle reaches 760 mm of Hg ? **(10 marks)**
2(a)	Two reversible heat engines A and B are arranged in series, A rejecting heat directly to B. Engine A receives 250 kJ at a temperature of 423°C from a hot source, while engine B is in communication with a cold sink at a temperature of 4.8°C. If the work output of A is twice that of B, find (a) The intermediate temperature between A and B (b) The efficiency of each engine (c) The heat rejected to the cold sink **(10 marks)**

1253-1

2(b)	Air flowing through a horizontal, insulated duct was studied by students in a laboratory. One student group measured the pressure, temperature, and velocity at a location in the duct as 0.95 bar, 67°C, 75 m/s. At another location the respective values were found to be 0.8 bar, 22°C, 310 m/s. The group neglected to note the direction of flow, however. Using the known data, determine the direction. **(7 marks)**
2(c)	The shaft work in a pump to increase the pressure is small compared to the shaft work in an air compressor for the same pressure increase. Why? **(3 marks)**
3(a)	Air enters a compressor in steady flow at 140 kPa, 17°C and 70 m/s and leaves it at 350 kPa, 127°C and 110 m/s. The environment is at 100 kPa, 7°C. Calculate per kg of air (a) the actual amount of work required, (b) the minimum work required, and (c) the irreversibility of the process. **(10 marks)**
3(b)	Air expands adiabatically in a turbine from 2 MPa, 1000°C to 350 kPa. The mass flow rate is 0.5 kg/s and the turbine develops power at the rate of 120 kW. Determine (a) the temperature of argon at the turbine exit, (b) the irreversibility rate, and (c) the second law efficiency. Neglect KE and PE effects and take To = 20°C, p_0 = 1 atm. **(10 marks)**
4(a)	Nitrogen is throttled from 30 MPa, −80°C, to 2 MPa in an adiabatic, steady-state, steady flow process. Determine the final temperature of the nitrogen. **(8 marks)**
4(b)	Nitrogen at 9 MPa, 160 K is throttled to 0.5 MPa. After the gas passes through a short length of pipe, its temperature is measured and found to be 125 K. Determine the heat transfer and the change of entropy using the generalized charts. **(12 marks)**
5.	Starting from basics, derive the following thermodynamics relations. **(4x5 =20)**
(a)	$u = F - T\left(\frac{\partial F}{\partial T}\right)_v = -T^2\left(\frac{\partial F/T}{\partial T}\right)_v$
(b)	$c_v = -T\left(\frac{\partial^2 F}{\partial T^2}\right)_v$
(c)	$c_p - T\left(\frac{\partial V}{\partial T}\right)_p\left(\frac{\partial p}{\partial T}\right)_v$
(d)	$\frac{(\partial V/\partial T)_s}{(\partial V/\partial T)_p} = \frac{1}{1-\gamma}$
6(a)	Discuss the change of Mach Number in Convergent Divergent Nozzle under various back Pressure. **(8 marks)**
6(b)	Prove that the Mach Number at the maximum enthalpy and maximum entropy points on the Rayleigh Flow are $1/\sqrt{\gamma}$ and 1.0 respectively. **(12 marks)**
7(a)	Plot the flow across the oblique shock wave and explain the variation of normal and tangential component of the velocity. **(7 marks)**

7(b)	Describe two practical situations where oblique shock waves are produced. How strong and weak shocks are generated and how it affects the flow? **(13 marks)**
8.	Write short notes on the following. **(20 marks)**
(a)	Joule Thomson Experiment
(b)	Lost Work
(c)	Generalized Compressibility Chart
(d)	Supersonic Airfoil

Total no. Of pages :2 Roll No.....

FIFTH SEMESTER M. Tech. [Thermal Engineering]

END SEM EXAMINATION (Nov.2019)

THE/ME 503 HEAT TRANSFER& FLUID MECHANICS

Time : 3 hrs Max Marks: 40

Answer any five questions. Assume missing data suitably if any.

Q1 the expression for critical thickness of insulation for (i)sphere and (ii) cylinder. State the condition for optimality using inner and outer convection mode.. (5)

(b)A circular disc of radius R is keptat a small height (h) above a fixed bed by means of layer of oil of dynamic viscosity . If the disc is totated at an angular velocity , then obtain an expression for the viscous torque on the disc. Assume linear variation of velocity within the oil film. (3)

Q-2(a) check whether the flo defined by the steam function is 2xy is irrotational? If so , then determine the corresponding velocity potential (3)

(b)Define following terms with physical significance:
Biot Number, Fourier Number, Geometric Number, Reynold Number , Stanton Number, Nusselt Number, NTU, Prandtl Number, Shear wood Number, Schmid Number, (5)

Q3.(a) Derive the expression for effectiveness of heat exchanger in Counter flow operation(3)

(b)Discuss the resume of boiling. (2)

(c) Derive the expression for rate of heat exchange between two surface and verify reciprocal theorem (3)

Q5(a)A person is found dead at 5 am in a room, the temperature of s which 20 (°C). The temperature of body is 25 (°C) , when found and heat transfer coefficient is estimated to be 10 $w/m^{2o}C$. Assume the human body of 30 cm dia and 170 cm long cylinder has 72% of water by mass. Assume its properties of water at room temperature. (Density=1000 kg/m^3), Cp=4180 J/KgK, K=0.608 W/mK. Assume human body temperature is 37.15(°C). Estimate the time of Death of above person. (5)

(b)Determine the geometric shape factor for a very small disc dA_1 and large parallel disc A_2 located at a distance L directly above the smaller one.(Both are placed in horizontal plane). (3)

Q6(a) A tube of 30 mm inner diameter is maintained at 100 (°C) and water at 20 (°C) is passed through the tube with a velocity of 0.5 (m/sec) and heated to 60 (°C). Assume : density of water at temperature of 40 (°C) as: Density (Kg/m^3)=1000, Specific Heat(J/Kg/K)=4200, Thermal conductivity (W/mK)=0.63, Viscosity (Kg/m-sec)=0.00065. Find the amount of heat transferred to the water, convective heat transfer coefficient and length of the tube.(4)

(b)two fixed parallel plates kept 8 cm apart have laminar flow of oil between them with a maximum velocity 1.5m/sec. taking dynamic viscosity of oil to be 2.0 $Nsec/m^2$. Compute (i) Discharge per metre width (ii) shear stress at the plate (iii) the pressure difference between two points25 m apart (iv) velocity at 2 cm from the plate and (v)
velocity gradient at the plate end, (4)

Q7. (a)Why fins are used. Define Fin efficiency and Fin Effectiveness . Derive the expression for temperature distribution and rate of heat transfer when fin is insulated. (1+3)

(b) Explain the essential features of Blasius method for solving laminar boundary layer equationfor a flat plate. Derive the expression for boundary layer thickness and local, skin friction coefficient from this solution (4)

Total no. of Pages 02 Roll no.....

First Semester **M.Tech. THE**

End Semester Examination **Nov/Dec-2019**

THE-5303 **OPTIMISATION TECHNIQUES (ME-5303)** THE

Time: 3 hrs **Max 50 MARKS**

Note : Answer any five Questions. All carry equal marks.

1. (a) Give a general mathematical formulation of LP Problem. Explain all terms. 4 marks

(b). A company makes two kinds of belts. Belt A is of high quality and Belt B is of lower quality. The respective profits are rupees 8 and rupees 6 per belt. Each Belt of Type 'A' requires twice as much time as Belt of type 'B' and if all belts were of type B , the company could make 1000 belts per day . the supply of leather is sufficient for only 800 belts (both A and B combined). Belt A requires a fancy buckle and only 400 such buckles are available per day . there are only 700 buckles a day available for type 'B'. determine the no of belts to be produced for each type so as to maximise profit. Solve by graphical method. 6 marks

2. (a) Solve by simplex method

Maximize, $Z = 11x_1 + 4x_2$

Subject to,

$7x_1 + 6x_2 \leq 84$

$4x_1 + 2x_2 \leq 32$

$X_1 \geq 0$

$X_2 \geq 0$ 5 Marks

(b) Use Big M method to solve the following LPP

Minimize, $Z = 12x_1 + 20x_2$

Subject to, $6x_1 + 8x_2 \geq 100$

$7x_1 + 12x_2 \geq 120$

$X_1 \geq 0$

$X_2 \geq 0$ 5 Marks

3. Three buildings are to be added to the college campus. Bids are submitted by 5 contractors. The bid figures are given in millions of rupees and are as shown in table below

Contractor	Bld A	Bld B	Bld C
1	2.90	1.62	-
2	3.10	1.75	2.81
3	3.05	1.80	2.90
4	2.85	1.55	2.75
5	-	1.70	3.00

Find the assignment of buildings to contractors that will result in a minimum total cost for the building programme. 10 Marks

4. A Manufacturing firm has three plants, A, B and C and three warehouse at Mumbai, Nagpur and Bangalore. Their capacities and requirements are shown in Table below.

Plants	Capacity	Warehouse	Requirements
A	40	Mumbai	55
B	50	Nagpur	45
C	40	Bangalore	30

The Transportation costs in Rupees from plants to warehouses are given below:

	Mumbai	Nagpur	Bangalore
A	11	9	6
B	12	14	11
C	10	8	10

There is no other condition, any plant can transport the product to any warehouses upto its requirement. Find most economical shipment to minimize the total transportation costs.

10 Marks

5. Explain the following with suitable examples. Explain the advantages.
   a) Principle of Optimality in Dynamic programming
   b) Monte Carlo method of Simulation

10 Marks

6. a) How Game theory is classified ? Explain with examples. 5 marks
   b) Patrons arrive at a reception counter at an average inter arrival rate of 2 minutes. The receptionist in duty takes an average of one minute per patron.
      I. What is the chance that a patron will straight way meet the receptionist?
      II. For what portion of time the receptionist is busy?
      III. What is the average queue length?
      IV. What is the average number of patrons in the system?
      V. What is the average waiting time of a patron?
      VI. What average time a patron spends in the system?
      VII. Suppose management wants to keep a second receptionist when the average waiting time of an arrival exceeds 1.5 minutes. Find what should be the average inter arrival time to justify a second receptionist? 5 marks

7. Explain with suitable examples
   a) Artificial Neural Networks 5 marks
   b) Fuzzy techniques 5 marks

Total No. of Pages 1 *Roll No.*_____

First Semester M.Tech

END SEMESTER EXAMINATION NOV 2019

THE-5403 Advanced I C Engines

Time: 3 Hours Max. Marks: 70

Note: Answer ANY FIVE Questions. All questions carry equal marks.

Answer to each question (or its part) must start on a fresh page.

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1. *a. Discuss the deviation in the performance of theoretical and actual fuel air cycles.*

b. Define the process of SI engine fuel metering. Explain the necessity and working of EFI in SI Engines.

2. a. What is ignition delay? Discuss the effect of various engine operating and fuel quality parameters on ignition delay

b.What is swirl? Explain the effect of the swirl on the combustion in SI Engines, how it can be improved?

3. a. Explain the IDI and DI Engines. Discuss the spray structure and fuel atomization.

b. A 4cylinder engine has been converted torun onCNG. A dry analysisof the engine exhaust gives he following volumetric percentages: CO_2 4.9%, CO 9.8%, O_2 2.6%. Calculate the equivelance ratio at which the engine is working.

4. a. Define the stages of combustion in SI engines. Explain the effect of the engine operation variables on p-Θ plot.

b. Discuss the requirements of an IC engine combustion chamber. Explain with examples how they are accomplished?

5. a.Discuss the various desirable properties of IC engine fuels. Explain the different fuel grading methods.

b.Explain the need of scavenging in two stroke engines and discuss its various designs.

6. a.Discuss various methods to increasethe power of an engine without increasing its size.

b.Describe engine lubricants, giving their types, additives and grading.

7. Explain the following brief: **ANY FOUR**

i)Combustion charts ii)HCCI iii) NOx emissions

iv) Free piston engines v)Steel piston vi) Abnormal combustion

—260—

Odd—

Total no. of Pages 02

Roll no..... ...

First Semester

M.Tech.

End Semester Examination

THE **Nov/Dec-2019**

OPTIMISATION TECHNIQUES (ME-513)

Time:03hrs

Max.Max 100

Note : Answer any five Questions. All carry equal marks.

1. Describe in brief the role of operation research models in decision making. Explain any two types of model. 20 marks

2. a) Define and explain the following term used in linear programming with suitable example

   I. Objective function
   II. Constraints
   III. Feasible solution
   IV. Optimal solution
   V. Decision variable
   VI. Degeneracy 10 Marks

b) A company makes two kinds of belts. Belt A is of high quality and Belt B is of lower quality. The respective profits are rupees 8 and rupees 6 per belt. Each Belt of Type 'A' requires twice as much time as Belt of type 'B' and if all belts were of type B , the company could make 1000 belts per day . the supply of leather is suffuicient for only 800 belts (both A and B combined). Belt A requires a fancy buckle and only 400 such buckles are available per day . there are only 700 buckles a day available for type 'B'. determine the no of belts to be produced for each type so as to maximise profit. Solve by graphical method. 10 Marks

3. a) Define Simplex method. What is the function of stack, surplus and artificial variables in simplex procedure.

Solve by simplex method

Maximize, $Z = 11x_1 + 4x_2$

Subject to,

$7x_1 + 6x_2 \leq 84$

$4x_1 + 2x_2 \leq 32$

$X_1 \geq 0$

$X_2 \geq 0$ 10 Marks

b) Use Big M method to solve the following LPP

Minimize, $Z = 12x_1 + 20x_2$

Subject to, $6x_1 + 8x_2 \geq 100$

$7x_1 + 12x_2 \geq 120$

$X_1 \geq 0$

$X_2 \geq 0$ 10 Marks

4.a) Three buildings are to be added to the college campus. Bids are submitted by 5 contractors. The bid figures are given in millions of rupees and are as shown in table below

Contractor	Bld A	Bld B	Bld C
1	2.90	1.62	-
2	3.10	1.75	2.81
3	3.05	1.80	2.90
4	2.85	1.55	2.75
5	-	1.70	3.00

Find the assignment of buildings to contractors that will result in a minimum total cost for the building programme. 10 Marks

b) A Manufacturing firm has three plants, A, B and C and three warehouse at Mumbai, Nagpur and Bangalore. Their capacities and requirements are shown in Table below.

Plants	Capacity	Warehouse	Requirements
A	40	Mumbai	55
B	50	Nagpur	45
C	40	Bangalore	30

The Transpotation costs in Rupees from plants to warehouses are given below:

	Mumbai	Nagpur	Bangalore
A	11	9	6
B	12	14	11
C	10	8	10

There is no other condition, any plant can transport the product to any warehouses upto its requirement. Find most economical shipment to minimize the total transportation costs. 10 Marks

5. Explain the following with suitable examples. Explain the advantages.
   a) Principle of Optimality in Dynamic programming 10 Marks
   b) Monte Carlo method of Simulation 10 Marks

6. a) How Game theory is classified ? Explain with examples. 10 marks
   b) Patrons arrive at a reception counter at an average inter arrival rate of 2 minutes. The receptionist in duty takes an average of one minute per patron.
      I. What is the chance that a patron will straight way meet the receptionist?
      II. For what portion of time the receptionist is busy?
      III. What is the average queue length?
      IV. What is the average number of patrons in the system?
      V. What is the average waiting time of a patron?
      VI. What average time a patron spends in the system?
      VII. Suppose management wants to keep a second receptionist when the average waiting time of an arrival exceeds 1.5 minutes. Find what should be the average inter arrival time to justify a second receptionist? 10 marks

7. Explain with suitable examples
   a) Artificial Neural Networks 10 marks
   b) Fuzzy techniques 10 marks

Total no. Of pages :2 *Roll No.....*

FIRST SEMESTER **M.Tech.[Thermal Engineering]**

END SEM EXAMINATION **(NOV.2019)**

ME 561 HEAT AND MASS TRANSFER

Time : 3 hrs **Max Marks: 100**

Answer **any five** questions. Assume missing data suitably if any.

Q1 the expression for critical thickness of insulation for (i)sphere and (ii) cylinder. State the condition for optimality(i) using inner and outer convection mode and (ii)neglecting inner convection mode(10+10)

Q-2(a) A Rectangular duct of size (400mm X 300mm) carries air at 25 (°C) to the room. The velocity of air is 600m/min. find the inside heat transfer coefficient, if the heat transfer coefficient on the outer surface of the duct is 20 (W/m^2K) and temperature of the atmosphere surrounding the duct is 10 (°C). Find the heat lost by the air per metre length of the duct. Neglect the resistance of the duct wall. The properties of air at 25 (°C) are: Density (Kg/m^3)=1.02, Specific Heat(J/Kg/K)=1000, Thermal conductivity (W/mK)=0.0256,Viscosity (Kg/m-sec)=0.0000182 (7)

(b)Define following terms with physical significance:
Thermal Diffusivity, Biot Number, Fourier Number, Geometric Number, Reynold Number , Stanton Number,Nusselt Number, NTU, Prandtl Number, Shear wood Number, Schmid Number, Stanton Number Thermal Diffusivity (13)

Q3. An Al pipe carries steam at 110 (°C) the pipe has thermal conductivity of 185 W/mK has an inner diameter of 10 cm and an outer diameter of 1.2 cm. The pipe is located in a room when the ambient air temperature is 30 (°C) and convective heat transfer coefficient is 1500 (W/m^2K). determine the rate of heat transfer per unit length of pipe. (7)

(ii) To reduce heat loss from the pipe, it is covered with 5 cm thick layer of insulation (K= 0.2 W/mK). determine the rate of heat transfer per unit length of pipe. (4)

(b).Oil is being cooled by water in a tube parallel flow type heat exchanger. Water enters the centre tube at 16 (°C)and is heated to 50(°C). The oil flow in annulus and cooled from 130 (°C) to 60 (°C). Find (i) The exit temperature of each fluid, if the existing heat exchanger was switted to counter flow operation

(ii) The minimum temperature to which oil may be cooled by increasing the tube length with (a) parallel flow operation and (b) Counter flow operation. (iii) The maximum possible effectiveness in (a) Parallel flow operation (b) Counter flow operation. Also find outlet the temperature of hot fluid and cold fluid also.(9)

Q4(a) Derive the expression for rate of heat exchange between two surface and verify reciprocal theorem (8)

(b) Determine the geometric shape factor for a very small disc dA_1 and large parallel disc A_2 located at a distance L directly above the smaller one.(Both are placed in horizontal plane). (12)

Q-5(a) A tube of 30 mm inner diameter is maintained at 100 (°C) and water at 20 (°C) is passed through the tube with a velocity of 0.5 (m/sec) and heated to 60 (°C). Assume : density of water at temperature of 40 (°C) as: Density (Kg/m^3)=1000, Specific Heat(J/Kg/K)=4200, Thermal conductivity (W/mK)=0.63,Viscosity (Kg/m-sec)=0.00065. Find the amount of heat transferred to the water, convective heat transfer coefficient and length of the tube. (8)

(b)A person is found dead at 5 am in a room, the temperature of s which 20 (°C). . The temperature of body is 25 (°C) ; when found and heat transfer coefficient is estimated to be 10 $w/m^{2o}C$. Assume the human body of 30 cm dia and 170 cm long cylinder has 72% of water by mass. Assume its properties of water at room temperature. (Density=1000 kg/m^3), Cp=4180 J/KgK, K=0.608 W/mK. Assume human body temperature is 37.15(°C). Estimate the time of Death of above person. (12)

Q-6(a) Derive the expression for temperature distribution and rate of heat transfer and heat energy stored using lumped capacity parameter method (6)

(b)Derive the expression for temperature distribution and rate of heat transfer of (i) hollow cylinderwith heat generation and (ii) sphere with heat generation. (7+7)

Q7. Why fins are used. Define Fin efficiency and Fin Effectiveness . Derive the expression for temperature distribution and rate of heat transfer when (i) fin is not insulated. (ii) fin is not insulated. (iii) fin is insulated. (2+5+7)

(b) Discuss the resume of boiling. (6)

Total No. of Pages -1 *Roll No. .....*

III SEMESTER (Mechanical) M.Tech.

(Thermal)/Ph.D

END SEMESTER EXAMINATION Nov-2019

ME-7112 ME-7122 Power Plant engineering

Time: 3 Hours *Max. Marks: 100*

Note: Attempt any five questions. Assume suitable missing data, if any.

1		Discuss the various aspects which are instrumental in the choice of particular type of power plant at a specified place. Substantiate your arguments with valid reasoning.	20
2	(a)	What are various methods used for pulverized fuel burning? Explain	10
	(b)	With the help of a simple diagram, explain the essential features of Nuclear power plant.	10
3	(a)	Discuss the principal requirements of a good ash handling plant.	10
	(b)	With the help of neat diagram explain an electrostatic precipitator Describe how its capacity is determined and its suitability.	10
4		Sketch the layout of hydroelectric power plant and explain the functions of each component in it. Discuss the advantages and limitations of this plant.	20
5	(a)	Discuss the criteria for selection of auxiliary equipments used in plants	10
	(b)	Why Nuclear power reactor uses Control rods and nuclear reactor needs a moderator material? Explain	10
6	(a)	How would you determine the Tariff for electric power? Discuss.	10
	(b)	What are the drawbacks of a stationary gas turbine power plant for generation of electricity? explain them briefly.	10

Total No. of Pages:02

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III SEMESTER

M.Tech. (Thermal)

END SEMESTER EXAMINATION *Nov/Dec-2019*

ME-7122 Renewable and Non-Conventional Energy Sources

Time: 3:00 Hours *Max. Marks: 100*

Note : Answer all question by Selecting any two parts from each questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[a] Discuss the various parameters affects the performance of Liquid Flat Plate Collector.

[b] Explain the working of Solar pond electric power plant with neat sketch.

[c] For Coimbatore (11.0183°N, 76.9725°E, and elevation of 411m above sea level), estimate the value of average daily global radiation on horizontal surface during the month of March. The average sunshine hours per day for the month of March may be assumed as 9.5 hours.

Q.2[a] Use following data to calculate the overall heat loss coefficient of Flat Plate Collector:

Size of absorber plate	2.15m × 1.15m
Spacing between absorber plate and first glass cover	5cm
Spacing between first and second glass cover	5cm
Glass cover emissivity	0.85
Plate emissivity	0.90
Mean plate temperature	75°C
Ambient air temperature	20°C
Collector tilt	30°
Wind speed	3m/s
Back insulation thickness	8cm
Side insulation thickness	4cm
Thermal conductivity of insulation	0.035W/m-K

[b] Explain I-V characteristic of dark and illuminated PN junction and also discuss maximum power point, fill factor and conversion efficiency of solar cell.

[c] Explain the Solar Cell, Module and Array construction with neat sketch.

Q.3[a] Drive an expression for power extraction from wind. What is maximum theoretical power that can be extracted under what conditions?

[b] Sketch the diagram of a HAWT and explain the function of its main components.

[c] Explain the gasification process of solid bio-fuel in downdraft biomass gasification plant.

Q.4[a] Explain the various stages of anaerobic digestion process. What are the main advantage of anaerobic digestion of biomass?

[b] Explain the various types of geothermal resources. What are the merits and demerits of geothermal energy?

[c] Drive power generation relation from tides with the help of neat sketch.

Q.5[a] Explain closed cycle OTEC plant with suitable diagram.

[b] Draw layout of micro hydro power station and explain all its components.

[c] Write short note on:

(i) Energy-Environment-Economy

(ii) Biomass conversion technology