

-07-

Total No. of Pages: 02

Roll No.

FIRST SEMESTER
END SEMESTER EXAMINATION

(B.Tech. All Branches)
(January- 2021)

AP-103

Applied Physics-I

(Group A & B)

Time : 3:00 Hours

Max. Marks : 70

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

1. (a). Explain the objective of Michelson-Morley experiment and also derive the expression for the fringe shift. Discuss the outcome of the results of this experiment. (10)
(b). A meson of mass π comes to rest and disintegrates into a meson of mass μ and a neutrino of zero mass. Show that the kinetic energy of motion of the μ meson (i.e. without the rest mass energy) is $\frac{(\pi - \mu)^2}{2\pi} c^2$. (4)
2. (a). Write the equation of motion for a forced mechanical oscillator. Derive the expression for the displacement of a particle in a forced harmonic oscillator and discuss the variation of velocity amplitude and displacement amplitude with driving force frequency (ω) for different values of damping constant. (10)
(b). The frequency of a damped simple harmonic oscillator is given by
$$\omega' = \frac{s}{m} - \frac{r^2}{4m^2} = \omega_0^2 - \frac{r^2}{4m^2}$$
If $\omega_0^2 - \omega'^2 = 10^{-6} \omega_0^2$, find Quality factor (Q) and logarithmic decrement (δ). (4)
3. (a). Explain types of diffraction bands produced in Fraunhofer diffraction at a single slit and show that the relative intensities of the successive maxima are
$$1 : \frac{4}{9\pi^2} : \frac{4}{25\pi^2} : \frac{4}{49\pi^2} : \dots$$
(10)
(b). What do you understand by absent spectra in the diffraction pattern due to a double slit? Plot the diffraction pattern obtained on screen for $d = 4e$, where d is the separation between the slits and e is the slit width. (4)
4. (a). What is pulse dispersion in the optical fiber and show that it is related to numerical aperture of the fiber. (10)

- (b). A step Index fibre is with a core of refractive index 1.55 and cladding of refractive index 1.51. Compute the intermodal dispersion/km of length of the fibre and total dispersion in a 15km length of the fibre.
5. (a). Discuss the formation of Newton's rings in reflected monochromatic light. Show that the diameters of Newton's dark rings are proportional to the square roots of natural numbers.
- (b). In a Newton's ring experiment, the diameters of the 4th and the 12th rings are 0.5 cm and 0.7 cm, respectively. Deduce the diameter of the 20th bright ring.
6. (a). Explain the principle and working of a He-Ne laser with clearly drawn energy level diagrams.
- (b). Find the ratio of spontaneous emission to stimulated emission for a cavity at temperature 50 K and wavelength 10^{-5} m.

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Total No. of Pages— 2.

Roll No.....

END SEMESTER EXAMINATION (Jan 2021)

AP-AC 114 Engineering Materials

Note: 1. Use separate Answer sheets for Part A and Part B.

2. Attempt any five questions from Part A

3. Assume suitable missing data, if any.

PART A

Max. Marks : 35

1. (a) Assume the energy of two particles in the field of each other, given by the following function of the distance between the centres of the particles.
 $U(r) = -(\alpha/r) + (\beta/r^8)$ where α and β are constants.
Find the distance at which the two particles will form a stable compound.
(b) Draw (111) plane in a triclinic lattice and (120) plane in a tetragonal lattice.
[4,3]
2. (a) Obtain the relationship between drift and diffusion currents in a semiconductor.
(b) Write the expression and describe the significance of the Fermi Dirac Distribution. How does it vary with temperature?
[4,3]
3. (a) Explain Meissner's effect. Differentiate between Type I and Type II superconductors.
(b) The critical field for niobium is 1×10^4 A/m at 8 K and is 2×10^5 A/m at 0 K. Calculate the transition temperature of the element.
[4,3]

4. Define polarization. List and explain various types of polarization.

[7]

5. (a) Derive an expression for the electrical conductivity of an intrinsic semiconductor.

(b) Explain how it can be used to measure energy band gap.

[5+2]

6. (a) Distinguish among the properties of para, ferro, ferri and anti ferromagnetic materials.

(b) The magnetic field strength in a piece of copper is 10^6 ampere/m. The susceptibility of copper is -0.6×10^{-4} . Find the flux density and magnetization of copper.

[4,3]

Total No. of Pages 02

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Roll No.

FIRST SEMESTER

B.Tech. [Group A]

END SEM EXAMINATION

(January-2021)

AP/AC-114 Engineering Materials

Time: 3 Hours

Max. Marks: 35

Note: Answer any FIVE questions from each part.

Question no. 1 is compulsory in each part.

Use separate answer sheet for Part-A & Part-B

Assume suitable missing data, if any.

(PART – B)

1. Answer all the questions.

[7x1]

- (a) Name the main non-ferrous alloys used in engineering.
- (b) Name the Dryer used for drying thin ceramic wares.
- (c) What are Glazes?
- (d) Write the examples of matrix materials.
- (e) What is the effect of Tungsten on steel?
- (f) Write the composition of Duralumin.
- (g) Write the applications of conducting polymers.

2. (a) What are composite materials? Write the limitations of conventional engineering materials.

[3]

(b) What are the factors on which the strength of composite material depend?

[4]

3. (a) Discuss the conduction mechanism of intrinsically conducting polymers.

[4]

(b) Describe the synthesis of Polypyrole.

[3]

P.T.O.

- 4.(a) What are refractories? Which raw materials are used for manufacturing refractories? [4]
- (b) Suggest and describe the test for determining Strength of a refractory material. [3]
- 5.(a) Which composite material will you recommend for making Aircraft body? Why? [2.5]
- (b) Which material will you recommend to manufacture cutting tools? Why? [2.5]
- (c) Which polymeric material will you recommend for demineralization of water? Why? [2]
- 6 (a) What are the major constituents of Cast iron and Gunmetal alloys. [2]
- (b) What are whiskers? Give two examples. [2]
- (c) What do you mean by ceramic materials? Give examples. [2]
- (d) What are ion exchange resins? [1]

THIRD SEMESTER

B.Tech.[EP]

END TERM EXAMINATION

(January-2021)

EP-201 INTRODUCTION TO COMPUTING

Time: 3 Hours

Max. Marks: 70

Note: Attempt any five questions. Use comment line in each program to write the script/function file name.

1. Following commands are written and saved in a Matlab script file. What will the output of this file in the command window? [14]

```
A = [3 1 2; 3 4 9; 9 11 12];
```

```
B=sum(A)
```

```
C=cumprod(A)
```

```
[index,value]=min(A,[],1)
```

```
E= diff(A,2,1)
```

```
F=A*A
```

```
G= A.*A
```

```
H=triu(A)
```

2. (a) Perform five iterations of the bisection method to obtain a root of the equation $f(x) = x^3 - x - 1 = 0$ lies in the interval (1, 2). [7]

- (b) Show that, to within the accuracy permitted by MATLAB [7]

$$\lim_{N \rightarrow \infty} \sum_{n=1}^N \frac{1}{n(n+1)} = 2$$

3. (a) The following table shows the time versus pressure variation reading from vacuum pump. Fit a curve, $P(t) = P_0 e^{-t/\tau}$, through the data and determine the unknown constants P_0 and τ . [7]

t	0	0.5	1.0	5.0	10.0	20.0
P	760	625	528	85	14	0.16

- (b) Fundamental mode (LP_{01}) of an optical fiber is having Gaussian shape. Radial distribution of this function is given by $\psi(r) = A_0 * e^{-(r-r_0)^2/w_0^2}$ where A_0 , r_0 and w_0 are constants.

Write a function script to calculate the radial distribution of Gauss function defined above with A_0, r_0, w_0 and r as input.

Call this function file in another Script file

To plot the Gaussian field for $r_0 = 0, 2, 4, \dots, 10$ (take $A_0 = 1, w_0 = 4$ and $-20 \leq r \leq 20$). Title of the above plot should indicate properly the values of the constants A_0 and w_0 .

4. (a) A nonlinear model of a pendulum is given by $\ddot{\theta} + \frac{g}{L} \sin \theta = 0$, where L is the length of the rod. Suppose $L = 1$ m and $g = 9.81$ m/s². Use Matlab to solve this equation for $\theta(t)$ for two cases $\theta(0) = 0.5$ rad and $\theta(0) = 0.8\pi$ rad. In both cases $\dot{\theta}(0) = 0$.

(b) Write a function file to print the first N terms of the famous Fibonacci series of thirteenth century.

Fibonacci series: 1, 1, 2, 3, 5, 8, 13, 21,

5. (a) Integration $\int_0^3 \frac{1}{x^2 - 4x + 5} dx$ using quadrature Matlab inbuilt function

Compare this result by writing a program based on trapezoidal method (do not use inbuilt function for trapezoidal method).

(b) Write a Matlab code to print the following in the command window

```
1 'plus' 1 = 2
1 'plus' 2 = 3
1 'plus' 4 = 5
End of inner loop
2 'plus' 1 = 3
2 'plus' 2 = 4
2 'plus' 4 = 6
2 'plus' 5 = 7
End of inner loop
3 'plus' 1 = 4
3 'plus' 2 = 5
3 'plus' 4 = 7
3 'plus' 5 = 8
End of inner loop
End of outer loop
```


6. Explain the following commandes with suitable exemples

[14]

- i. fprintf
- ii. plotyy
- iii. gtext
- iv. num2str
- v. hold on
- vi. contour
- vii. diff

————— 0 —————

Note: Answer any FIVE questions

Assume suitable missing data, if any.

1. (a) Discuss the application of tensor analysis to the strain in the case of one-dimensional and then extend the discussion to two-dimensional plate.
 (b) What is Quotient Law of Tensors? Define Kronecker delta and show that the Kronecker delta is a mixed tensor of order two.
2. (a) Evaluate $\iint_S \vec{F} \cdot \vec{n} dS$ over the entire surface of the region above xy -plane bounded by cone $z^2 = x^2 + y^2$ and the plane $z=4$, if $\vec{F} = 4xz \hat{i} + xyz^2 \hat{j} - 3z \hat{k}$.
 (b) Use Green's theorem in a plane to evaluate the integral $\oint_C [(2x^2 - y^2)dx + (x^2 - y^2)dy]$ where C is the boundary in the xy -plane of the area enclosed by the x -axis and the circle $x^2 + y^2 = 1$ in the upper half xy -plane.
3. (a) Prove that the function $\sinh z$ is analytic and find its derivative.
 (b) State and prove Cauchy's integral formula. Use it to find Cauchy's formula for derivative of an analytic function.
4. (a) Derive the various possible solutions to Laplace's equation in two dimensional Cartesian coordinates by the method of separation of variables.
 (b) Derive the solution of the equation for the vibrating rectangular membrane.
5. (a) Define shift operator and derive the relation between the Mean operator and difference operator.
 (b) Using Runge-Kutta method of fourth order to solve $y(0.1)$, $y(0.2)$, given that $y'(0) = 1$.
6. Define the following with one example:

(i) Transformation law for fifth rank tensor
 (iii) Contraction

(ii) Interpolation and Extrapolation
 (iv) Harmonic functions

Total No. of Pages 2

Roll No.

THIRD SEMESTER

B.Tech. I EPI

END TERM EXAMINATION

(January-2021)

EP- 204: Digital Electronics

Time: 3 Hours

Max. Marks: 70

Note: Attempt Any Seven questions.

Assume suitable missing data, if any

- 1.(a) Design a Bidirectional Shift Register with a suitable example in each case of Left Shift and Right Shift. [5]
- (b) Explain the refreshing circuitry mechanism in DRAMs with diagram and distinguish between Static RAM and Dynamic RAM. [5]
- 2.(a) Design a memory expansion interconnection of 32×1 static RAMs to construct a 64×1 memory. Each RAM has an active low- chip select line and common data-in pins. [5]
- (b) Describe a common cathode 7-segment display. Why edge triggering is preferred over level triggering in flip-flops? [5]
- 3.(a) The data word 1011 is stored in a 4-bit shift register. The data word 0100 is fed in serially without clearing the previously stored word. Plot the clock, data and Q_0 to Q_3 waveforms. [5]
- (b) Using the postulates of Boolean algebra, simplify the following Boolean expression: $F = x'y'z + xyz + x'yz + xy'z$ [5]
- 4.(a) What is J-K Master Slave flip-flop ? Draw its logic circuit, truth table and explain its working. How does it avoid the race-around condition? [5]
- (b) Using Behavioural Modeling, write a VHDL code for the design of a 4 to 1 line Multiplexer. [5]

P.T.O.

5. Design and analyse the Digital to Analog Converter based on Binary weighted Resistor, with the help of a circuit diagram. Also explain the terms resolution and monotonicity.
6. Design a synchronous MOD-6 counter using D-flip flop with the following count sequence:
1, 2, 0, 6, 7, 5 and repeat
Also check for a bush.
7. For an 8-bit DAC, determine the weights assigned to 4th LSB and the output voltage for 11010101? Assume the full scale output voltage to be 10V. Compare the logic families ECL and TTL in terms of Fan-out, Speed and Power Dissipation.
8. Convert SR flip-flop to T flip-flop and obtain the conversion table, the corresponding logic diagram and the equations relating the input and outputs of the 2 flip-flops.

Total No. of Pages 2

THIRD SEMESTER

END SEMESTER EXAMINATION

EP- 203 Thermal Physics (Old Scheme)

Time: 3 Hours

Roll No.

R.Tech. (EP)

(Jan.-2021)

Max. Marks: 70

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

- Q. 1(a) A mass 'm' of a liquid at temperature T_1 is mixed with an equal mass of same liquid at temperature T_2 . The system is thermally insulated. Prove that the change in entropy of the universe is

$$2mC_p \log_e \frac{(T_1 + T_2)}{2\sqrt{T_1 T_2}} \quad (5)$$

- (b) Calculate the amount of work done when one litre of a mono atomic perfect gas, originally at NTP, is compressed adiabatically to half its volume. What would be the work done if the gas were compressed isothermally? ($\gamma = 1.66$, $R = 8.4 \times 10^3$ J/mole) (5)

- Q. 2(a) Show that for a perfect gas $(\partial U / \partial V)_T = 0$ (5)

- (b) A mass m of water at temperature T_1 is isobarically and adiabatically mixed with an equal mass of water at temperature T_2 . Show that the entropy change of the universe is

$$2mC_p \log [(T_1 + T_2) / (4T_1 T_2)^{1/2}] \quad (5)$$

- Q. 3(a) Explain the application of the adiabatic expansion of a gas in the calculation of Adiabatic lapse Rate. (5)

- (b) A gas obeying the equation of state $P(V-B) = RT$ undergoes a change from the initial state T_1, V_1 to a final state T_2, V_2 . Derive an expression for the entropy change of this gas. The variation of heat capacity at constant volume is given by $C_v = a + bT + cT^2$. (5)

- Q. 4 Write Maxwell's four thermodynamic relations. Using Maxwell's thermodynamic relations, derive Ehrenfest relations for second order Phase transitions. (10)

- Q. 5(a) Discuss the properties of Helium I and Helium II. What do you understand by λ -point? Give properties of helium II. (5)

- (b) Calculate the critical current density for 1mm diameter wire of lead at 4.2 K. Assume parabolic dependence of H_c upon T. Given T_c for lead is 7.18K and H_0 for lead is 6.5×10^4 amp/meter. (5)

- Q. 6(a) What is the significance of Partition Function Z in statistical physics? How is it related to different thermodynamic functions? (5)

- (b) Three particles are to be distributed in four energy levels a, b, c, d. Calculate all possible ways of this distribution when particles are (i) Fermions, (ii) Bosons, (iii) Classical Particles. (5)

- Q. 7(a) Derive London's equations for superconductivity and explain how its solution explain Meissner effect. (5)

- (b) Using Maxwell's Distribution Law of velocities, Find the value of v_r for which the probability falls to (i) $1/e$ times (ii) $1/10$ times, the maximum value. (5)

- Q. 8 Write short notes on : (any two) (10)

- i) Gibb's Paradox ii) Chemical Potential for Open Systems
iii) Rutgers formula in superconductivity

END

ORIGINAL

— 20 —

Total no. of pages: 4

Roll No. _____

**THIRD SEMESTER
END SEMESTER EXAMINATION**

**B.Tech. (EP)
January 2021**

EP-205

Engineering Mechanics

Time: 3:00 Hour

Max. Marks: 70

**Note: 1. Attempt any five questions.
2. Assume missing data, if any**

Q-1 (a) State and prove the Varignon's theorem. [5]

(b) Three uniform, homogeneous and smooth spheres A, B, and C weighting 300 N, 600 N and 300 N, respectively and having diameters 800 mm, 1200 mm and 800 mm respectively, are placed in a trench as shown in Fig.-1. Determine the reactions at contact points P, Q, R and S.

[9]

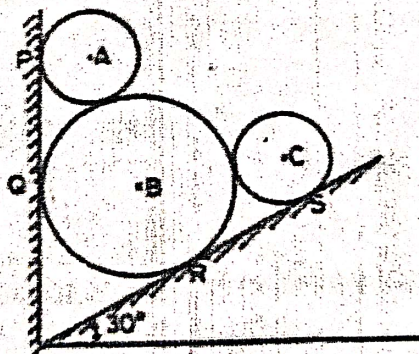


Fig.-1

Q-2 (a) Explain the different types of force systems.

[7]

20-17

(b) Determine centroid of plate as shown in Fig.-2. There six rivets holes of 21.5 mm diameter. [7]

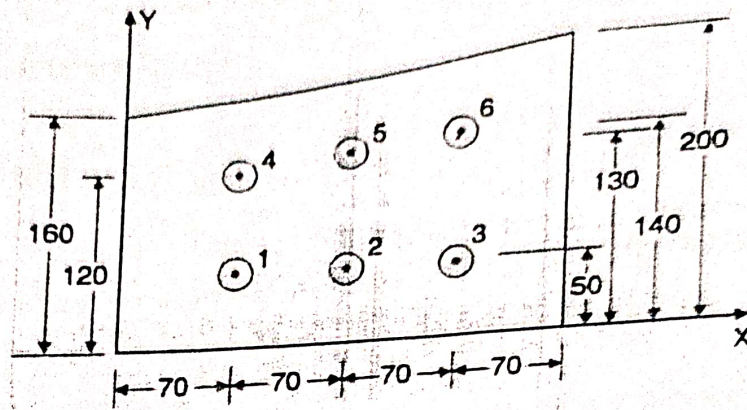


Fig.-2 (all dimensions are in mm)

Q-3 (a) Explain parallel shifting of force. [5]

(b) Determine the reaction at the support at A, B, C, D as shown Fig.-3 [9]

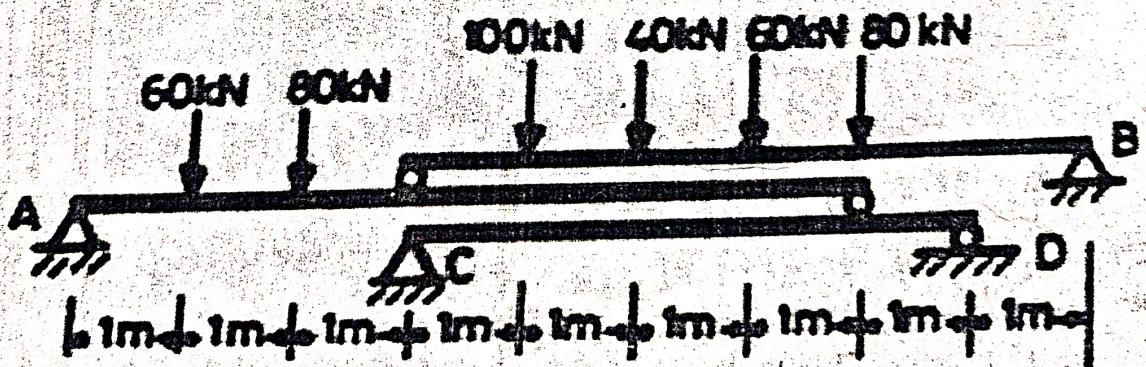


Fig-3

Q-6 (a) Differentiate between work done and virtual work done. [6]

(b) Draw SFD and BMD of the load diagram as shown in Fig.-6.

[8]

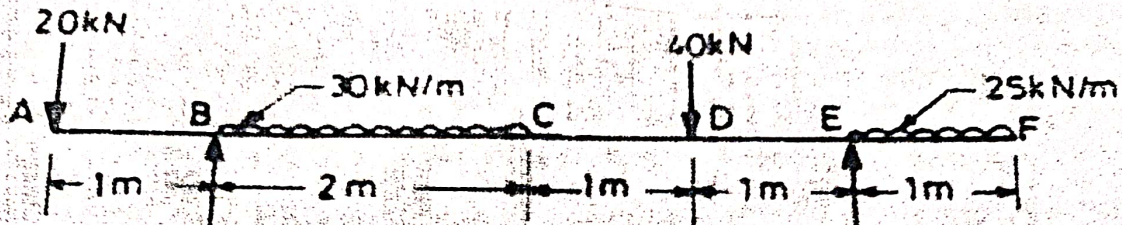


Fig -6

Q-7 (a) Two weights 800 N and 200 N are connected by a thread and they move along a rough horizontal plane under the action of a force of 400 N applied to the 800 N weight as shown in Fig.-7. The coefficient of friction is 0.3. Using D' Alembert's principle determines the acceleration of the weight and tension in thread.

[7]

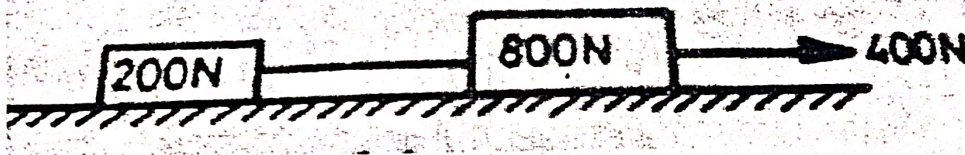


Fig.-7

(b) A ball dropped from the top of tower 30 m high. At the same instant a second ball is thrown upward from the ground with an initial velocity of 15 m/sec. When and where do they cross and with what relative velocity.

[7]

21-A

- Q-4 (a) State D' Alembert's principle. How is it similar to the equilibrium equation as obtained from Newton's second law.
- (b) Determine the forces in the truss as shown in Fig.-4.

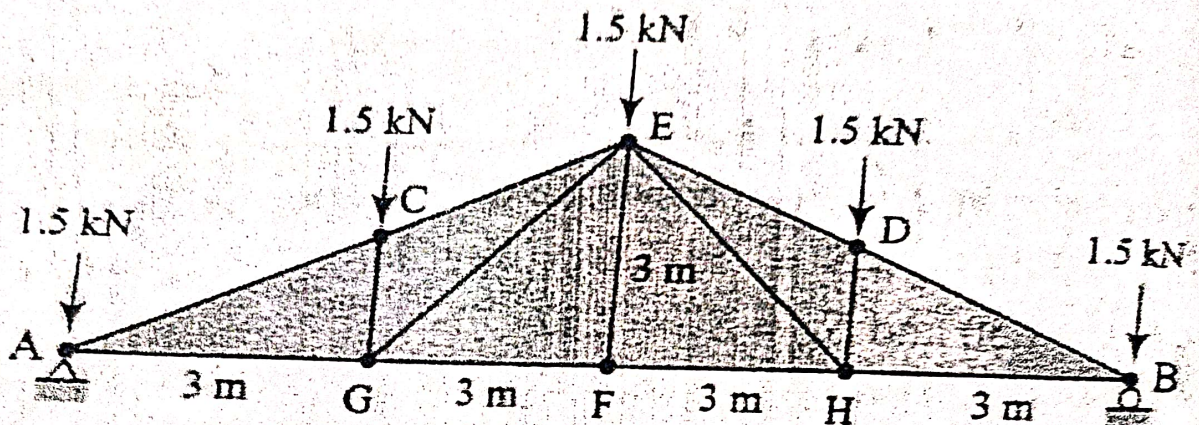


Fig-4

- Q-5 (a) Define angle of friction and angle of repose. [5]
- (b) Two blocks connected with a tie rod are shown in Fig.-5. $\phi_B = 15^\circ$ and $\mu_A = 0.40$, find the smallest value of W for the equilibrium of the system. [9]

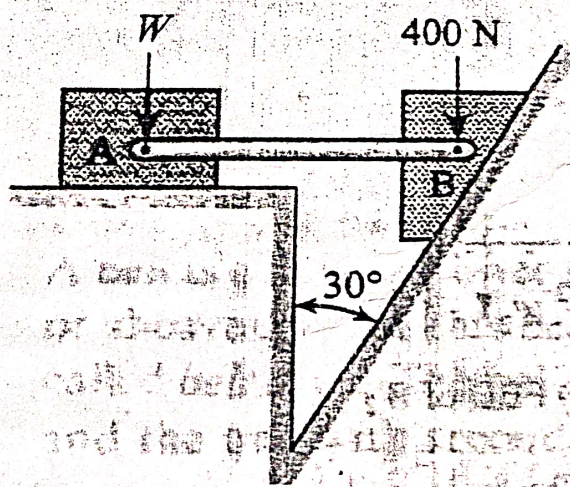


Fig.-5

Total No. of Pages 02

Roll No.....

FIFTH SEMESTER

B.Tech. (EP)

END SEMESTER EXAMINATION

January-2021

EP-302 COMMUNICATION SYSTEM

Time: 3 Hours

Max. Marks: 70

Note: Answer **ALL** questions.

Assume suitable missing data, if any.

Q1: i) Precisely mention the two critical factors which affect the performance of any communication system? What does modulation actually do to a message and carrier? (05)

ii) Explain channel noise and its effects. Define noise. Where is it most likely to affect the signal? Draw block diagram of communication systems? Define signal to noise ratio and noise figure of a receiver. When might the latter be a more suitable piece of information than the equivalent noise resistance? (05)

iii) Draw non-linear resistance characteristics and prove that harmonic and intermodulation distortion may occur in audio and RF amplifiers. Explain the effect of non-linear resistance on added signals in Amplitude Modulation? (05)

Q2: i) List, separately, the various sources of random noise and impulse noise external to a receiver. How can some of them be avoided or minimized? What is the strongest source of extraterrestrial noise? (05)

ii) A 400-watt (400 W) carrier is modulated to a depth of 75 percent. Calculate the total power in the modulated wave? A broadcast radio

transmitter radiates 20 kilowatts (20 kW) when the modulation percentage is 60. How much of this is carrier power? (05)

iii) Prove that the balanced modulator produces an output consisting of sidebands only, with the carrier removed. Other than in SSB generation, what applications can this circuit have? (05)

Q3: i) Define amplitude modulation and modulation index. Use a sketch of a sinusoidally modulated AM waveform to help explain the definition. What are sideband frequencies in AM wave? Illustrate them with an example? (05)

ii) In an FM system, when the audio frequency (AF) is 500 Hz and the AF voltage is 1.2 V, the deviation is 2.4 kHz. If the AF voltage is now increased to 4.8V, what is the new deviation? If the AF voltage is raised to 5 V while AF is dropped to 100 Hz, what is the deviation? Find the modulation index in each case? (05)

iii) Derive the formula for the instantaneous value of an FM voltage and define the modulation index? What is the bandwidth required for an FM signal in which the modulating frequency is 2 kHz and the maximum deviation is 10 kHz? (05)

Q4: Discuss any FIVE from the following:

(5 x 5 = 25)

- (a) Production and detection of Frequency Modulated Wave
- (b) Phase Modulation
- (c) Production and detection of Amplitude Modulated Wave
- (d) Noise Factor and Frequency Modulation
- (e) Modulation factor and classification of transmitters
- (f) Friss Formula and limitations of Amplitude Modulation

Total No. of Pages 1

FIFTH SEMESTER

END SEMESTER EXAMINATION

EP 303 : ELECTROMAGNETIC THEORY, ANTENNAS & PROPAGATION

Time : 3.00 Hours

Roll No.....

B.Tech. (Engineering Physics)

JANUARY 2021

Max. Marks : 70

Note : Attempt any five Questions

Assume suitable missing data, if any

1. (a) Using Maxwell's equations derive the electric and magnetic wave equations. (12)
 (b) Differentiate between TE and TM waves. (2)
2. What do you understand by the terms- cutoff frequency, dominant mode, guide wavelength, phase velocity, group velocity and wave impedance for rectangular waveguides. (14)
3. (a) Explain with schematic diagram (10)
 (i) Reflection Coefficient (ii) Transmission Coefficient (iii) Standing wave pattern.
 (b) What are the characteristics of Smith Chart? (4)
4. (a) Define the following terms in connection with sky wave propagation (10)
 (i) Maximum Usable Frequency (MUF) (ii) Critical frequency (iii) Skip distance
 (b) What is the physical significance of Maxwell's Equations? (4)
5. (a) Show that the solution to the Helmholtz equation in rectangular coordinates is given by (10)

$$\psi = [A \sin(k_x x) + B \cos(k_x x)] [C \sin(k_y y) + D \cos(k_y y)] e^{-j\beta_g z}$$
 (b) Show that the ratio of the cross-section of a circular waveguide to that of a rectangular one $A_c/A_r = 2.17$ if each is to have the same cutoff wavelength for its dominant mode. (4)
6. (a) Explain the following terms with respect to Antenna (i) Radiation resistance (ii) Directivity (iii) Effective Area (iv) Half-Power Beam Width. (12)
 (b) What are the characteristics of Antenna Arrays? (2)
7. Show that the dispersion relation for surface plasma waves is given by

$$k_z = \frac{\omega \epsilon_r^{1/2}}{c} \left(\frac{\omega_p^2 / \omega^2 - \epsilon_L}{\omega_p^2 / \omega^2 - (\epsilon_L + \epsilon_r)} \right)^{1/2}, \text{ where } \epsilon_L = \epsilon_{eff} + \omega_p^2 / \omega^2. \quad (14)$$

Total No. of Pages: 1

Roll No.

FIFTH SEMESTER

B.Tech [E P]

END SEMESTER EXAMINATION

(Jan/Feb 2021)

EP-304-Semiconductor Devices

Time : 3:00 Hours

Max. Marks : 70

Note: Answer **FIVE FOUR** questions
Assume suitable missing data, if any.

-
1. (a). Define density of states and derive expression for density of states? (10M)
(b). Find density of states per unit volume with energies between 1 and 1.5 eV. (4M)
 2. (a). Describe the formation of bands in solids using Kronig-Penney model. (10M)
(b). Deduce an expression for thermal-equilibrium hole concentration in valence band of an intrinsic semiconductor. (4M)
 3. (a). Explain the graded impurity distribution in a semiconductor. Draw the energy level diagram with a non-uniform donor impurity concentration and derive the expression for induced electric field developed with non-uniform doping. (10M)
(c). If mobility of a particular carrier is $1000 \text{ cm}^2/\text{V-s}$ at $T=300 \text{ K}$, then determine the diffusion coefficient of the carrier. (4M)
 4. (a). Explain the formation of built-in potential barrier in an unbiased pn junction and hence deduce an expression for built-in potential in an unbiased pn junction. (10M)
(c). Write any three basic assumptions ideal current-voltage relationship. (4M)
 5. (a). What is a compensated semiconductor? Deduce the expressions for electron and hole concentrations in a compensated semiconductor. (7M)
(b). What is a Hall effect and hence deduce expressions for carrier concentration in a semiconductor. (7 M)
 6. (a). Compare the working conditions of Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET). (7 M)
(b). Explain how BJT works as an amplifier. Deduce an expression for collector current in terms of amplification factor in a common base configuration. (7 M)

Note: Answer any five questions. Draw a neat diagram wherever required.

- 1 Write short note on **any two**: (7+7=14)
(i) Automaticity and Pacemaker (ii) The Goldman Hodgkin equation (GHK equation)
(iii) Neuromuscular junction (NMJ) (iv) Donnan equilibrium
- 2 What is cell membrane? Giving suitable diagram, discuss structure and functions (14)
of cell membrane
- 3 What are ion channels? What are the significance and properties of ion channels?
Giving suitable diagrams discusses:- (2+2+5+5=14)
(i) Voltage gated ion channel (ii) Ligand gated ion channel.
- 4 What is action potential? Define the following terms related to action potential:
(Any two) (4+5+5=14)
(i) Plateau (ii) Depolarization
(iii) Hyper Polarization (iv) Refractory period
- 5 (i) What are proteins? Differentiate between primary and secondary (7+7 = 14)
structure of proteins.
(ii) What is gap junction? Giving suitable diagram discuss structure and function of
gap junction.
- 6 (i) Discuss how molecular biology help in studying the different ion channels.
(ii) What are neurons. Discuss conduction mechanism in neurons. (7+7 = 14)

Total No. of Pages: 2

Roll No.

SEVENTH SEMESTER

B.TECH. [EP]

END SEMESTER EXAMINATION (old Scheme)

(January- 2021)

EP-401 ALTERNATIVE ENERGY STORAGE AND CONVERSION DEVICES

Time: 3 Hours

Max. Marks: 70

Note: There are NINE Questions in this paper. Answer Any SEVEN questions.

Assume suitable missing data, if any.

1. Define insolation in solar radiation. Derive the relation for insolation at horizontal surfaces for both the equinoxes and equator. Calculate the global radiation on a horizontal surface at New Delhi in May, 1995, If the monthly average of daily hours of bright sunshine observed (n) is 2.1 hours. [10]
- 2(a). Discuss about the 2-D and 3-D type solar concentrators. Show that the maximum temperature obtained in 3-D solar concentrator is approximately 5900 K. [5]
(b). A silicon diode, operating at 300 K, is exposed to 6000-K black body radiation with a power density of 1000 W/m^2 . Its efficiency is 20% when a load that maximizes power output is used. Estimate the open-circuit voltage delivered by diode ($\phi_g = 2.50 \times 10^{21} \text{ photons m}^{-2}\text{s}^{-1}$). [5]
3. What are the fundamental thermodynamic parameters for the cell reaction? Discuss the oxidation and reduction process reactions on both the electrodes for lead acid (Pb-acid) batteries. Show that the equilibrium cell voltage (U^0) is independent of both the electrode materials but depend on the concentration of acid. [10]
4. Distinguish between charging/discharging and other physico-chemical properties of Lithium-ion, lead-acid and Ni-metal hydride batteries? Discuss the working and oxidation/reduction process reactions of lithium-ion batteries. [10]

1.

5. Briefly discuss the various source of extraction of bio-fuels? By draw flowchart and chemical reactions, discuss the various steps of e production from sugar cane. Also point out the merit and demerits of cane as a source ethanol. [1]
6. Discuss about ocean waves as source of energy. Write the relation for and group velocities for deep and shallow water in terms of wavelength out the approximate energy density of ocean wave of density of w roughly 1000 kg/m^3 and the height of wave is 35 meters. [1]
7. Discuss the anaerobic digestion process of glucose to extract m considering all bacterial reactions. Find out the power density of the di in terms of allowable loading rate, if digester fraction and ideal yield a and $125 \text{ MJ (CH}_4\text{) /Kg (VS)}$, respectively. [1]
8. Explain briefly about Savonius rotor and Anemometers? Discuss characteristics of Drag and lift type wind turbines. Show that the powe wind turbine is proportional to the cube of the wind velocity: $P_D = \frac{16}{54} \rho v^3 A \eta$ where η is efficiency of wind turbine. A, swept area of the wind turbine. [5]
9. Explain any **TWO**:
 - (a) Reaction type hydraulic turbine
 - (b) Solid Oxide Fuel Cells (YSZ type)
 - (c) Insolation on stationary surface

2.

Total No. of Pages 02

Roll No.....

SEVENTH SEMESTER

B.Tech. (EP)

END SEM EXAMINATION

January-2021

EP-402 MOBILE AND SATELLITE COMMUNICATION

Time: 3:00 Hours

Max. Marks: 70

Note: Answer ALL questions.

Assume suitable missing data, if any.

- Q1: (i) Explain multiple access techniques in Wireless communication?
Mention precisely the difference between CDMA & TDMA. (5)
- (ii) Explain the evolution of wireless communication system along with the role of interference and system capacity? What is Baud? What are the possible sources of Noises in wireless communications? (5)
- (iii) Find the upper and lower sideband frequency in a modulated wave if a carrier of 1 MHz is modulated by 1 kHz signal? An 400 KHz carrier is modulated by 15 kHz signal. What are the various frequencies contained by the modulated wave? (5)
- Q2: (i) Explain "How a cellular telephone call is made"? Illustrate the concept of roaming and roamer in wireless communication system? (5)
- (ii) Write the role and importance of bandwidth requirement in wireless communication? Explain the difference between Half and Full duplex systems? Define Grade of service (GoS) and trunking efficiency? (5)
- (iii) If a signal to interference ratio of 15 dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if

the path loss component is $n=4$? Assume that there are 6 co-channel cells in the first tier, and all of them are at the same distance from the mobile? Use suitable approximations. (5)

Q3: (i) Explain different modulation techniques for digital signals? What are different medium characteristics for digital communication? (5)

(ii) What is carrier communication? Explain in brief time division multiplexing and frequency division multiplexing? (5)

Q4: Discuss any SIX from the following: (6x5=30)

- (a) Difference between DPSK and QPSK
- (b) Modulation factor, Co-channel interference
- (c) Modulator and de-modulator, Limitations of AM
- (d) Frequency reuse and Cellular Mobile Radio Systems
- (e) Cellular telephone systems, Base station and Trunking
- (f) Traffic intensity and system capacity
- (g) Set-up time, Holding time, Request rate

EP-4041 COMPUTER NETWORKS

Time: 3:00 Hours

Max. Marks: 70

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

- Q.1 [a] What is need for layered architecture of computer networks ? explain in detail.
[b] Draw the TCP/IP protocol and explain functions of each layer briefly. (7+7=14)
- Q.2 [a] What are client-server and peer-to-peer architecture of networks?
[b] How do Firewalls ensure the security of computer networks? (7+7=14)
- Q.3 [a] Explain all the SMTP and POP work for sending and receiving Emails?
[b] Compare and contrast the LAN interconnecting devices; hubs, switches and routers. (7+7=14)
- Q.4 [a] What is network topology ? Explain advantage and disadvantage of various network topologies.
[b] Draw and explain in detail the functions of all fields in the TCP header format. (7+7=14)
- Q.5 [a] Explain (with diagram) the IPv4 protocol header in detail.
[b] What was the need of IPv6? What are the advantages of IPv6 over IPv4 (7+7=14)
- Q.6 Write Short notes on:
[a] FTP
[b] LANs (7+7=14)

END

Note : Answer any 5 (five) question. All questions carry equal marks.
 Assume suitable missing data, if any.
 Use of steam tables and Mollier diagram is allowed.

Q.1[a] Explain quasi-static process, thermodynamic equilibrium and thermodynamic work. 7

[b] Gas from a bottle of compressed helium is used to inflate an inelastic flexible balloon, originally folded completely flat to a volume of 0.5 m^3 . If the barometer reads 760 mm Hg, what is the amount of work done upon the atmosphere by the balloon? Sketch the system before and after the process. 7

Q.2[a] Explain two methods of measuring quality of steam. Also draw h-s or T-s diagrams. 7

[b] Steam initially at 0.3 MPa, 250°C is cooled at constant volume. (i) At what temperature will the steam become saturated vapour? (ii) What is the quality at 80°C ? 7

Q.3[a] A fluid is confined in a cylinder by a spring-loaded, frictionless piston so that the pressure in the fluid is a linear function of the volume ($p = a + bV$). The internal energy of the fluid is given by the following equation $U = 34 + 3.15 pV$, where U is in kJ, p in kPa, and V in cubic metre. If the fluid changes from an initial state of 170 kPa, 0.03 m^3 to a final state of 400 kPa, 0.06 m^3 , with no work other than that done on the piston, find the direction and magnitude of the work and heat transfer. 7

[b] Explain first law of thermodynamics and prove that $\delta Q = \delta W + dE$ for a thermodynamic closed system undergoing a process. 7

Q.4[a] Derive steady flow energy equation and specify assumptions made.

[b] Air flows steadily at the rate of 0.5 kg/s through a compressor, entering at 7 m/s velocity, 100 kPa pressure, and $0.19 \text{ m}^3/\text{kg}$ volume, and leaving at 5 m/s, 700 kPa, and $0.19 \text{ m}^3/\text{kg}$. Internal energy of the air leaving is 90 kJ/kg greater than that of air entering. Cooling water in the compressor jackets absorbs heat from the air at the rate of 58 kW. (a) Compute the rate of shaft work input to the air in kW. (b) Find the ratio of the inlet pipe diameter to outlet pipe diameter.

Q.5[a] What are the limitations of first law of thermodynamics? Explain second law of thermodynamics with the help of Kelvin-Planck and Clausius statements.

[b] It is proposed that solar energy be used to warm a large collector plate. This energy would, in turn, be transferred as heat to a fluid within a heat engine, and the engine would reject energy as heat to the atmosphere. Experiments indicate that about $1880 \text{ kJ/m}^2 \text{ h}$ of energy can be collected when the plate is operating at 90°C . Estimate the minimum collector area that would be required for a plant producing 1 kW of useful shaft power. The atmospheric temperature may be assumed to be 20°C .

Q.6[a] One kg of water at 273 K is brought into contact with a heat reservoir at 373 K. When the water has reached 373 K, find the entropy change of the water, of the heat reservoir, and of the universe.

[b] In a certain process, a vapour, while condensing at 420°C , transfers heat to water evaporating at 250°C . The resulting steam is used in a power cycle which rejects heat at 35°C . What is the fraction of the available energy in the heat transferred from the process vapour at 420°C that is lost due to the irreversible heat transfer at 250°C ?

Q.7 Write notes on any two of the following: (i) Orsat Apparatus (ii) Enthalpy of Formation and adiabatic flame temperature (iii) Reduced Co-ordinates, compressibility factor and Law of corresponding states.

Total no. of pages :2

3rd SEMESTER

END SEMESTER EXAMINATION

AE – 202 NUMERICAL TECHNIQUES AND COMPUTER PROGRAMMING

Time : 3 hrs

Roll No. _____

B.Tech (AE)

Jan 2021

Max. Marks: 70

Note: Attempt all questions selecting two parts from each question. All are of equal marks. Assume missing data, if any.

1. (a) Find the root of the equation: $\sin x = 1 + x^3$ between -2 & -1 correct to three decimal places by Newton-Raphson method.

- (b) Solve the following system of equations by Gauss-Seidel method.
 $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$

- (c) Find a real root of $\cos x = 3x - 1$ which lies between 0 to $\frac{\pi}{2}$ correct to 3 decimal places by fixed point iteration method.

2. (a) The population of a town is as follows.

Year(x)	1941	1951	1961	1971	1981	1991
Population in lakhs(y)	20	24	29	36	46	51

Estimate the population increase during the period 1946 to 1976.

- (b) Evaluate $f(9)$ using Newton's divided difference formula.

x	5	7	11	13	17
y = f(x)	150	392	1452	2366	5202

- (c) Write a computer programme in "C++" for Newton-Raphson method

3. (a) The distance covered by an athlete for 50 meter race is given in the following table

t(sec)	0	1	2	3	4	5	6
s(m)	0	2.5	8.5	15.5	24.5	36.5	50

Determine the speed of the athlete at $t=5$ sec.

- (b) From the given table below find angular velocity ($\frac{d\theta}{dt}$) and angular acceleration ($\frac{d^2\theta}{dt^2}$) at $t=0.6$ second. By using Stirling's central differentiation formula.

t(second)	0.0	0.2	0.4	0.6	0.8	1.0	1.2
θ (radian)	0	0.12	0.49	1.12	2.02	3.20	4.67

- (c) Write a programme in "C++" for interpolation up to four terms using Newton's forward formula.

4. (a) Solve the differential equation using Picard's method
 $\frac{dy}{dx} = xe^y$, $y(0) = 0$. Also estimate y at $x = (0.1)$ and (0.2) .

- (b) Evaluate $\int_4^{5.2} \log_e x \, dx$ by Simpson's one-third rule.

- (c) Write a programme in "C++" for evaluation of definite integral using Simpson's one-third rule.

5. (a) Using Euler's modified method, find a solution of the differential equation:
 $\frac{dy}{dx} = x + \sqrt{y}$, $y(0) = 1$. For the range $0 \leq x \leq 0.4$ in steps 0.2

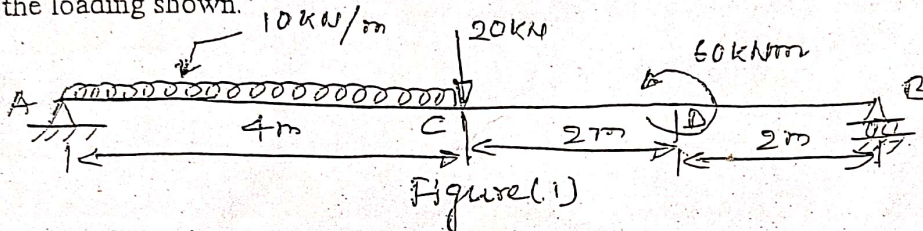
- (b) Given that: $\frac{dy}{dx} = 1 + y^2$, $y(0) = 0$. Find $y(0.4)$ by Runge-Kutta method of fourth order. Take steps size $h=0.2$.

- (c) Use Milne's predictor corrector method to find $y(0.4)$.
 Given that: $\frac{dy}{dx} = \frac{1}{2}(x^2 + 1)y^2$, $y(0) = 1$, $y(0.1) = 1.06$,
 $y(0.2) = 1.12$, $y(0.3) = 1.21$.

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

- (1) (a) Two forces equal to P and $2P$ respectively acts on a particle. When the first force is increased by $120N$ and the second force is doubled, the direction of the resultant remains the same. Determine the value of force P . [7]

- (b) A beam AB of span $8m$ is hinged at A and is on rollers at B . It carries uniformly distributed load, a concentrated load and an externally applied moment as shown in figure (1). Determine the reactions at A and B for the loading shown. [7]

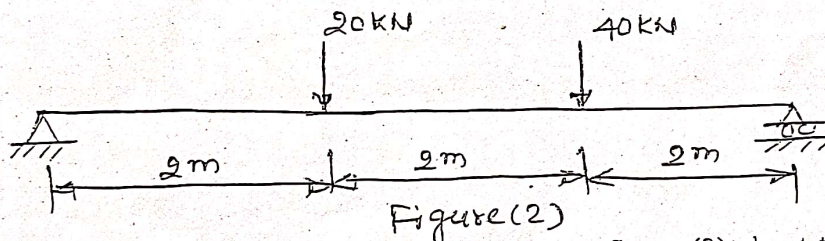


- (2) (a) Write notes on the following:

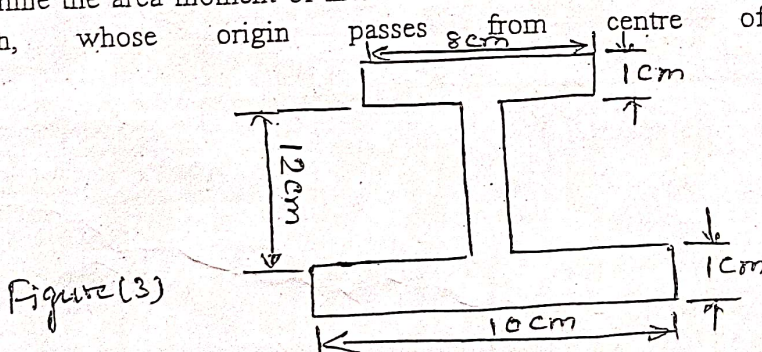
(i) Lami's theorem

(ii) Varignon's theorem

- (b) Use the principle of virtual work to determine the support reactions for the beam loaded in figure (2) [7]



- (3) Determine the area moment of inertia of I-section given in figure (3) about the X-X axis and Y-Y axis both, whose origin passes 8cm from centre of gravity of the section. [14]



- (4) (a) What is the efficiency of a screw jack? Also explain self-locking. [3+2]
Determine the magnitude and nature of forces, in all members of the truss, as shown in the figure (4). [9]

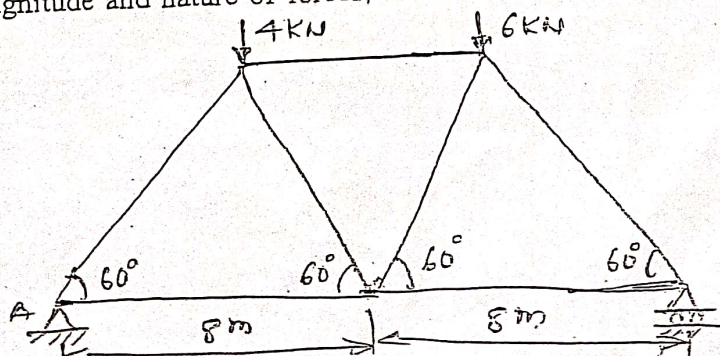
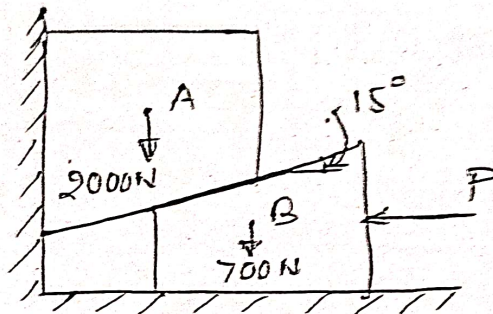


Figure (4)

(5) (a) Derive $\frac{T_1}{T_2} = e^{\mu\theta}$ where notations have their usual meanings

(b) Block A weighting 2000N is to be raised using 15° wedge B weighting 700N. The coefficient of friction for all contact surfaces is 0.2. Calculate the minimum horizontal force that is required to raise block as shown in figure (5).



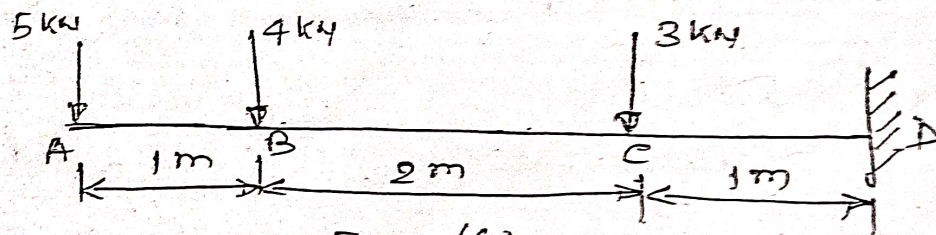
Figure(5)

(6) (a) Explain (i) Law of friction.

(ii) Friction cone

(iii) Angle of repose

(b) Draw shear force diagram and bending moment diagram for loading of a beam, as shown figure(7).



Figure(6)

(7) Acceleration of a particle moving along a straight line is represented by a relation $a = 30 - 4.5x^2 \text{ m/s}^2$ Where x in the meter. The particle starts with zero velocity at $x = 0$. Determine (a) the velocity when $x = 3\text{m}$, (b) the position where the velocity is again zero, (c) the position where the velocity is maximum and (d) the maximum velocity.

Note: Answer Any Five questions. All questions carry equal marks. Assume suitable missing data, if any. Use of statistical tables is allowed.

1. [a] Define of various measure of dispersion. (7)
[b] What are the various source of false data and how it affects the analysis. (7)
2. [a] Differentiate between discrete and continuous random variable. List name of some standard distributions from each category and discuss their applications. (7)
[b] The life-time in hours of a certain electrical equipment has the normal distribution with mean = 80 and standard deviation = 16. (7)
 - i) What is the probability that the equipment lasts at least 100 hours?
 - ii) What is the probability that equipment will survive between 70 to 110 hours.

3. [a] The data for quarterly sales of an item is given in the Table.

Quarter	1	2	3	4	5	6	7	8
Sales	1000	1200	1500	1600	2200	2500	2700	3000

- Use linear regression to forecast sales for the tenth quarter. (7)
- [b] Discuss estimation of parameters for difference of mean in two cases when sample size is large and another when sample size is small. (7)
4. [a] How we identify the case of multiple optimal solutions and unbounded solutions in graphical solution of LPP. (7)

[b] Find the optimal solution of the following LPP using simplex method.
 Maximize $Z = 4x + 10y$
 Subject to the constraints: $2x + y \leq 50$; $2x + 5y \leq 100$

$$2x + 3y \leq 90; \text{ and } x, y \geq 0.$$

5. [a] Explain least cost method for initial solution of a transportation problem.

[b] Find optimal solution of the following transportation problem.

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	2	3	11	9	15
S ₂	2	1	3	5	25
S ₃	6	4	7	3	20
Demand	10	15	25	10	

6. [a] What is the role of game theory in decision making.

[b] The daily demand of cars for hiring in a city is as follows:

Demand	12	13	14	15	16
Probability	0.2	0.1	0.3	0.3	0.1

The parking charges per car are Rs 100 per day if a car is not hired. If a company hires a car, a company gets Rs 250 rent per car per day. If a car is hired, the company does not have to pay parking charges. The company wants to enter into business in the city. Construct a payoff table to determine how many cars the company should have based on the minimax criterion. What will be the marketing manager's decision if regret criterion is applied?

7. Write short notes on any four topics out of the following:

[a] Skewness measures

[b] Dominance principles in game theory

[c] ANOVA

[d] Hypothesis testing

[e] Chi-square test

[f] Assignment problem

Total no. of pages : 1

**THIRD SEMESTER
END SEMESTER S EXAMINATION
AE-205 METALLURGY**

Time : 3 HRS

Roll No. _____

B.Tech (AUTOMOBILE ENGG.)

JANUARY 2021

Max. Marks: 70

Note: Attempt any 5 questions. Assume missing data , if any.

- | | |
|--|----|
| 1a. Discuss about different types of defects in crystals and their effect on the Mechanical properties of the materials. | 07 |
| 1b. Discuss about Bravais' space lattice of crystal systems. | 07 |
| 2a. Discuss about Ductile to Brittle transition of BCC crystals. | 07 |
| 2b. Draw and explain Creep in materials. Suggest suitable design considerations against Creep. | 07 |
| 3a. Explain about, low cycle fatigue and high cycle fatigue. | 07 |
| 3b. Compare Ductile fracture and Brittle fracture mechanisms. | 07 |
| 4a. Draw and explain Isomorphous Phase diagrams. | 07 |
| 4b. Discuss about Eutectic system with a suitable diagram. | 07 |
| 5a. Draw and explain TTT diagram. | 07 |
| 5b. Explain Iron- Iron carbide diagram and its importance in manufacturing industry. | 07 |
| 6a. Discuss about different types of Stainless Steel | 07 |
| 6b. Discuss about the composition properties and application of most important Bronzes. | 07 |

— 40 —

Total No. of Page-01

Roll No.....

THIRD SEMESTER

B. Tech. OLD SCHEME

END SEMESTER EXAMINATION

Jan

AE-206

Principles of Manufacturing Systems

Maximum Mar

Time: 3:00 Hours

Note: Answer any FIVE questions.

- 1 (a) Explain the working of cupola with the help of a diagram.
(b) Explain different types of allowances used in pattern with an example.
- 2 (a) Explain the working of centrifugal casting with the help of a diagram.
(b) Explain gating and rising in casting process.
- 3 (a) What is welding? Explain the difference between soldering and brazing.
(b) Explain the submerged arc welding with an example.
- 4 (a) Explain Gas welding technique with example.
(b) Explain the spot resistance welding process with an example.
- 5 (a) Explain any three processes of sheet metal work with example.
(b) Name different metals used for sheets. Name the metal of the sheet used for iron almirah.
- 6 (a) Explain the forging process with an example.
(b) Explain the rolling operation with an example.

— 41 —

Total No. of Pages 2

Roll No. _____

FIFTH SEMESTER

B.Tech (AE)

END SEMESTER EXAMINATION

(JAN-2021)

AE-302 AUTOMOTIVE ELECTRICAL & ELECTRONICS

Time: 3Hours

Max. Marks : 70

Note : Question no 1 is compulsory. Attempt four more questions by selecting two questions from each part

Assume suitable missing, if any.

- 1[a] What do you mean by rating of a battery?
- [b] What is meant by battery plate sulphation?
- [c] Give the requirements of starter motor.
- [d] What do you mean by third brush regulation?
- [e] List out the problems encountered in the contact points of ignition system.
- [f] Differentiate hot spark plug from cold spark plug.
- [g] What is adaptive ignition system?

PART A

- 2[a] Explain the constant current charging method of automotive batteries with a sketch.
- [b] Explain the care and maintenance of automotive batteries.
- 3[a] Describe the testing procedure for laboratory and manufacturer's tests of lead-acid battery with neat sketches.
- [b] Explain the constructional and working details of solenoid operated pinion drive of starter motor with a sketch.
- 4[a] Explain the working principle of alternator with its three stator circuits. State the advantages of it over D.C. generator.
- [b] Explain the centrifugal and vacuum advance mechanisms with the help of neat sketches.

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- [b] Explain the centrifugal and vacuum advance mechanisms with the help of neat sketches.
- 5[a] Explain electronic spark timing/control with a circuit diagram.
- [b] Explain the distributor less ignition system with suitable sketches.

PART B

- 6[a] Draw internal architecture of the 8085 microprocessor. Name different control signals of 8085 microprocessor and explain use of each one.
- [b] Name the different addressing modes supported by 8085 instruction set and explain each one with the help of suitable examples.
- 7[a] Distinguish between memory mapped I/O and I/O mapped I/O.
- [b] Write an assembly language program using 8085 instructions to multiply two unsigned 8 bit binary numbers using shift and add algorithm. Also, explain working of the algorithm with an example.
- 8[a] With the help of a schematic diagram, explain how a DAC can be interfaced to 8085. Also, explain how different waveforms can be generated using the DAC interface circuit.
- [b] Draw timing diagram for MVI A, 43H instruction.

Total No. of Pages -2

V SEMESTER (Automobile)
END SEMESTER EXAMINATION

Roll No.

B.Tech.

Jan-2021

AE-304 FLUID MECHANICS & HYDRAULIC MACHINES

Time: 3 Hours

Max. Marks: 70

Note: Answer all question by Selecting any two parts from each questions.

All questions carry equal marks.

Assume suitable missing data, if any.

- 1 (a) Define the terms specific volume, mass density and specific weight 7
- (b) Differentiate between dynamic viscosity and Kinematic viscosity 7
- (c) State and explain Capillarity and Surface Tension and their relation if any 7
- 2 (a) Classify the types of fluid flows. 7
- (b) Explain the terms Path line, Streak line, Stream line and Stream tube. 7
- (c) Differentiate between Velocity Potential Function and Stream Function 7
- 3 (a) Drive an expression for Bernoulli's equation and List of assumptions which are made while deriving Bernoulli's equation. 7
- (b) What are the applications of Bernoulli's equation? Explain one in detail 7
- (c) Explain the Terms: Model, Prototype, model analysis and Similitude 7
- 4 (a) Define laminar boundary layer, turbulent boundary layer and boundary layer thickness. 7
- (b) Derive an expression for loss of head due to friction in pipes (Darcy Weisbach equation) 7
- (c) A flat plate 1.5 m X 1.5 m moves at 50 km/hour in stationary air of density 1.15 kg/m^3 if the co-efficient of drag and lift are 0.15 and 0.75 respectively. Determine The lift force and the drag force. 7

— 44 —

- 5
- (a) Discuss the impact of jets on flat and curved plate
 - (b) Compare the hydraulic pump, compressor and fan.
 - (c) Define and explain cavitation in centrifugal pump.

Total No. of pages 1

**SEVENTH SEMESTER
END SEMESTER EXAMINATION**

Roll No.

B. TECH AE (OLD SCHEME)

JAN 2021

— 45 —

AE 402 Production and operations Management-2

Time 3Hours

Max. Marks: 70

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

1. Define productivity, what are the factors affecting productivity, state the advantages of increasing productivity to (i) Management (ii) Employees (iii) society
2. Explain the following with neat sketches (i) Flow process chart (material) (ii) SIMO chart
3. Discuss briefly the different factors affecting scheduling and different techniques for priority decision in scheduling.
4. Explain how the aggregate plans and master production schedules serves as initiators of action in other functional activities of the organization.
5. What are the objectives and basis of quality in factories? Suggest a scheme for the evaluation of quality control in a mass production organization.
6. Write short notes on (i) process capability (ii) limits of control charts.
7. Explain the double sample plan of O.C. curve.
8. Suggest an organizational chart for a car manufacturing industry. Explain the position of maintenance department in it.
9. Write short notes on (i) Total planned quality maintenance (ii) Business process re-engineering
10. Explain how use of work study leads to higher productivity in a manufacturing unit.

VII SEMESTER

B.Tech.(Automobile Engg.)

END SEMESTER EXAMINATION Jan-2021

PAPER CODE: AE-4039 (Old scheme) & TITLE OF PAPER:
Fuel Cells

Time: 3:00 Hours

Max. Marks: 70

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] Explain a lay out of a fuel cell in automobile.
[b] Explain the difference between ordinary batteries and fuel cell.
[c] Write short note on efficiency of electrochemical energy conversion with factors affecting on it.
- Q.2 [a] Explain the four major steps in the generation of electricity within a fuel cell.
[b] Define the terms: electrophoresis and electro-osmosis. What are limitations in calculation of zeta potential.
[c] Discuss in detail importance of double layer Stern model.
- Q.3 [a] Discuss the various methods to improve the kinetic performance of a fuel cell.
[b] Discuss the relation between activation energy and reaction rate.
[c] Explain the reaction schematics of phosphoric acid fuel cells.
- Q.4 [a] What are benefits and limitations of Solid oxide fuel cells.
[b] Environmental impact of solid oxide fuel cells; explain briefly.

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[c] Compare the molten carbonate fuel cell technology with H_2/O_2 fuel cell systems.

- Q.5 [a] Explain the Gibbs free energy formation in electrochemical fuel cell
- [b] Discuss the milestones in technology development and applications of proton exchange membrane fuel cells?
- [c] What are different pathways of hydrogen production; briefly.

Note: Answer *Any Five* questions. All questions carry equal marks. Assume suitable missing data, if any. Use of statistical tables is allowed.

1. [a] How would you identify the following special cases in LPP.

i) Alternate optimal solutions. ii) Infeasible solution iii) Unbound solution.

Explain with graphical approach. (7)

- [b] Find the optimal solution of the following LPP using simplex method.

Maximize $Z = 45x + 80y$

Subject to the constraints: $5x + 20y \leq 400$; $10x + 15y \leq 450$
and $x, y \geq 0$. (7)

2. [a] Explain Vogel's approximation method for initial solution of a transportation problem. (7)

[b] XYZ company has four jobs to be done on four machines. Each job must be done on one and only one machine. The cost (in Rs.) of each job on each machine is given in the following cost table:

Cost Table

Machine

Job	Machine			
	W	X	Y	Z
A	7	9	8	13
B	16	16	15	11
C	16	19	10	15
D	16	17	14	16

— 48 —

3. [a] Discuss the application of queuing models. (7)
[b] Define various terminologies used in developing queuing models. (7)

4. [a] Explain the bath tub curve and correlate the phase where the replacements are done (7)

[b] A machine owner finds from his past record that the costs per year of maintaining machine whose purchase price is Rs. 6000 are given in the following table. Determine at which age replacement is due. (7)

Year →	1	2	3	4	5	6	7	8
Resale price	3000	1500	750	375	200	200	200	200
Maintenance cost (Rs.)	1000	1200	1400	1800	2300	2800	3400	4000

5. [a] Write applications of Game Theory in decision making. (7)
[b] Explain algebraic method of solving game theory problem. (7)

6. [a] A project has the following time schedule:

Activity	Predecessor Activity	Time (months)	Activity	Predecessor Activity	Time (months)
A	-	2	G	C	3
B	-	2	H	D	1
C	-	1	I	E, G	5
D	A	4	J	F	4
E	B	8	K	H, J	3
F	B	5			

Draw a network. (4)

[b] Find critical path using CPM approach and compute the project duration. (5)

[c] What are the advantages of project management? Differentiate between PERT and CPM. (5)

10. [a] Johnson Rule
[d] Sensitivity analysis
[e] Resource levelling
[f] Hungarian algorithm

-----END-----

48-A

NOTE: Answer any five questions.
Assume suitable missing data if any.

Max. Marks: 70

1. (a) Explain why thermoplastic polymers can be remoulded but thermosets can't? Give two examples of each class of polymers. 4
(b) Define: i) Degree of Polymerization ii) Functionality. 2
(c) Write the IUPAC names of the following polymers: 4
i) Polyethylene ii) Polypropylene iii) Polyurethane iv) Phenol-formaldehyde
(d) Write a note on molecular weight of polymers. 4
2. (a) What is step polymerization. Write the polymerization reactions for polyamides and polyesters. 5
(b) Discuss the kinetics of linear stepwise polymerization. 5
(c) Explain the laboratory methods used to measure the rate of vinyl polymerization. 4
3. (a) Describe the cationic mechanism for polymerization of isobutylene with BF_3 catalyst. 4
(b) Write a brief account on nucleophilic initiators in anionic polymerization. 3
(c) Justify the statement, 'Ring Opening Polymerization has some aspects of both Chain and Step polymerization'. 4
(d) Which scientific work earned Zeigler and Natta a joint award of Noble Prize in Chemistry? 3
4. (a). Explain the free radical mechanism of copolymerization. 4
(b) State the differences in the structures of random, graft and block copolymers. 5
(c) Explain how the reactivity of monomers and radicals in copolymerization is dependent on steric hindrance. 5
5. (a) What are the advantages and disadvantages of Bulk Polymerization? 4
(b) How Emulsion polymerization is carried out? 5
(c) Why polymer separates out in the form of beads in Suspension polymerization? 4
6. (a) What is tacticity? Explain the different types of polymers based on tacticity. 3
(b) Discuss the possible termination modes in free radical chain polymerization. 3
(c) Compare Radical versus Ionic polymerization. 3
(d) Comment on Technical significance of Copolymerization. 3
(e) Write the examples of surfactants used in Suspension polymerization. 2

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

- Q.1[a] With a neat circuit diagram and waveforms explain the working of full wave bridge rectifier and show that its ripple factor is 0.48.
- [b] Design Zener voltage regulator for the following specifications:
Input Voltage= $10V \pm 20\%$, Output Voltage= $5V$, $I_L=20mA$,
 $I_{zmin}=5mA$ and $I_{zmax}=80mA$.
- Q.2[a] Explain the working of a transistor in common emitter configuration with input and output characteristics
- [b] Enumerate the ideal characteristics of Operational Amplifier
- Q.3[a] In the biasing circuit shown in Fig. 1, a supply of $6V$ and a load resistance of $1k\Omega$ is used. (a) Find the value of resistance R_B so that a germanium transistor with $\beta = 20$ and $I_{CBO} = 2\mu A$ draw an I_C of $1mA$. (b) What I_C is drawn if the transistor parameters change to $\beta = 25$ and $I_{CBO} = 10\mu A$ due to rise in temperature ?

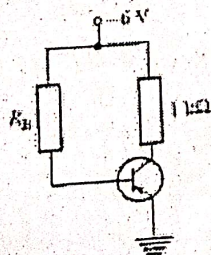


Fig.1.

- [b] Explain the operation of Class A amplifier and derive an expression for its efficiency.

Q.4[a] Simplify the following function using K-map method:

$$F(ABCD) = \sum m(1, 2, 4, 11, 13, 14, 15) + \phi(0, 5, 7, 8, 10)$$

[b] Design a one bit comparator

[c] State and prove the Demorgan's Theorems

Q.5[a] Explain the working of UJT as relaxation oscillator

[b] Explain the working of four universal shift register

Q.6[a] Write the characteristic equations for SR, JK flip flop.

[b] Explain the working of master slave JK flip flop with circuit diagram and waveforms.

Q.7. Write short notes on any TWO of the following:

(a) Schottky Diode

(b) Series clipper circuit

(c) Asynchronous Decade counter

(d) Voltage divider bias of the transistor

Total No. of Pages 1

— 52 —

Roll No. _____

~~FOURTH~~ SEMESTER — III

B.Tech. (PSCT)

END SEMESTER EXAMINATION (OLD SCHEME)

Jan-2021

PT-203 Polymer Structure & Properties

Time: 3h

Maximum Marks: 70

Note: Answer ALL questions

Assume Suitable missing data if any

1. (a) Explain gel permeation chromatographic method in detail to understand the information about the molecular weight distribution.
(b) Explain the light scattering method to determine the polymer molecular weight.
2. (a) Explain the principle and instrumentation of FTIR spectroscopy in detail.
(b) State and discuss the expected IR spectrum of PET and polypeptide.
3. (a) Discuss the changes in specific volume of semi crystalline polymer with temperature.
(b) What is End group analysis? Explain.
4. (a) Explain in detail XRD method to find the crystallinity of the polymer.
(b) Explain crystallization kinetics in detail.
5. (a) Explain the shear thinning and shear thickening behaviour of polymers with suitable examples.
(b) Explain kelvin model of viscoelasticity.
6. (a) Explain how molecular geometry and molecular aggregate affect the glass transition temperature with suitable examples.
(b) Write a note on MALDI-MS.
7. (a) Differentiate between TGA and DTA.
(b) Discuss the principle of DMA.

Total no. of Pages....21

3rd SEMESTER

END SEMESTER EXAMINATION
(Old Scheme)

PT204- Rubber Technology

Roll No.....
[B.Tech]
(Jan 2021)

Time: 3hour

Max Marks: 70

<p>Note: answer any five questions Assume suitable missing data, if any</p>

- | | | |
|---------|--|-----|
| Q. 1(a) | What are the molecular structural requirements for a material to act as a rubber | 7 |
| (b) | Explain the thermodynamic theory of rubber elasticity | 7 |
| Q.2 (a) | Discuss the processing of latex into sheet and pale crepe rubber | 7 |
| (b) | Discuss the method of stabilization of latex | 7 |
| Q.3 (a) | Discuss the stress and strain relationship for vulcanized and unvulcanised rubber | 7 |
| Q.4 (a) | What is the need for addition of vulcanising agents? State the different types of vulcanizing agents with examples | 7 |
| (b) | Explain the need for addition, mechanism of functioning of the following additives with respect to rubber | 3.5 |
| | (a) Peptizer | |
| | (b) Blowing agent | |
| Q.5 (a) | Discuss the working principle of mooney viscometer | 7 |
| (b) | Discuss the manufacturing process of rubber gloves using dipping method | 7 |
| Q.6 (a) | Discuss the synthesis and properties of thiokol rubber | 7 |
| (b) | Write short note on | 3.5 |
| | (a) Polybutadiene rubber | |
| | (b) Rubber products | |

Total No. of Pages :1
Third SEMESTER

- 54 -

Roll No.....

B.Tech. (Old)

END SEMESTER EXAMINATION

Jan.-2021

PT205 Elements of Chemical Engineering

Time: 3:00 Hours

Max. Marks: 70

Note: All questions carry equal marks.

Q.1 Explain any two Unit Operations in detail.

Q.2 In a non-reactive unit operation two streams are mixed. Flow rate of first stream is 5 kg/s and second stream is 8 kg/s. First stream contains 0.4 weight percent of component X and second stream contains 0.5 weight percent of component X. Calculate the flow rate output stream and concentration of X in output stream.

Q.3 Explain the two processes used for size reduction of solid material in the chemical industries.

Q.4 What are the mechanical properties required in the materials for chemical equipment construction and why?

Q.5 Name the plastics used in the construction of chemical equipment construction with their properties and applications.

-END-

Total no. of Pages...2
5th SEMESTER

END SEMESTER EXAMINATION
(Old Scheme)

PT-304 Fibre Technology

Roll No.....
[B.Tech]
(Jan 2021)

Time: 3 hour

Max Marks: 70

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

- Q.1 Justify the following statement
- (a) Concentration of polymer in dope is always higher in dry spinning as compared to wet spinning. 3
- (b) Natural fibres have comfort properties 4
- Q.2 (a) Why wool fibre shows darkest shade as compared to silk and nylon when dyed with same amount of the dye. 3
- (b) Write the role of heat and electrolyte in dyeing of cotton fiber with direct dye 4
- Q.3 (a) Give classification of fibres with suitable example 3
- (b) What are the essential properties of fibre forming polymers 4
- Q.4 (a) How drawing improves the strength of the thermoplastic filaments 3
- (b) Write a short note on spin finish 4
- Q.5 (a) Discuss the working principle of thermo-mechanical texturing process 3
- (b) Draw the time temperature profile and reactions involved in dyeing of (a) Basic Dye with acrylic fiber (b) Reactive dye with cotton 4
- Q.6 With the help of neat diagram discuss the dry spinning process 3
- Q.7 How PET fibre manufacture through DMT route 4

Q.8 Explain role and importance of VK tube

Q.9 Discuss the manufacturing process of viscose rayon, its properties and application

Total no. of Pages : 02

THIRD SEMESTER

END SEMESTER EXAMINATION

Roll no.....

B.Tech.

Jan-2021

PAPER CODE CE-202

MATHEMATICS AND NUMERICAL METHODS

Time: 3:00 Hours

Max. Marks : 70

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

Q.1 (a) State and prove Cauchy integral formula.

(b) Evaluate the integral $I = \int_0^{2\pi} \frac{d\theta}{2 + \cos \theta}$ using Residue theorem.

Q.2 (a) Solve the following system of linear of equations by Gauss-Elimination method.

$$x + 4y - z = 5, \quad x + y - 6z = 12, \quad 3x - y - z = 4.$$

(b) Solve the system of equations by Gauss-Seidel Method correct up to two places of decimal only

$$3x - 2y + 8z = 4, \quad 5x + y - z = 12, \quad x + 6y + 2z = 6$$

Q.3(a) Show that the function $u(x, y) = x^3 - 3xy^2$ is harmonic. Also find its conjugate harmonic Function $v(x, y)$ and the corresponding analytic function $f(z)$.

(b) Use Newton-Raphson method to find a real root of $\cos x = 3x - 1$ correct up to four decimal places.

Q.4 (a) The population of a town in the decennial census is given below:

Year	1891	1901	1911	1921	1931
Population (in thousands)	46	66	81	93	101

Estimate the population for the year 1920.

(b) Evaluate the integral using Simpson's one-third Rule with $n=2$, 4 and also compare with exact solution $\int_0^2 \frac{dx}{x^2 + 2x + 1}$.

Q.5 (a) Define Analytic function, find P such that the function $f(z)$ expressed in polar co-ordinate as

$$f(z) = r^2 \cos 2\theta + i r^2 \sin P\theta$$

is analytic.

(b) Using Secant method find a real root of the equation $f(x) = x^3 - 4x - 9 = 0$.

Q.6 (a) Apply Runge-Kutta method of order 4 to find approximate value of y for $x = 0.3$ in steps of 0.1, if

$$\frac{dy}{dx} = x + y^2, \text{ given that } y = 0, x = 0.$$

(b) Given $\frac{dy}{dx} = \frac{y-2x}{y+2x}$; $y(0) = 1$

Find y approximately for $x = 0.2$ with step size $h=0.05$ by Euler's Method using four decimal places.

P.T.O.

B.TECH 5TH SEMESTER CIVIL ENGINEERING
END SEMESTER EXAMINATION, DEC-2020
CE-301 GEOTECHNICAL ENGINEERING I

MAX MARKS: 70

TIME: 3.00Hr

NOTE: QUESTION NO. 1 IS COMPULSORY. ATTEMPT ANY FOUR QUESTIONS FROM
REST. ASSUME THE MISSING DATA IF ANY. (4x3.5=14)

1. Check the validity of the statement and explain briefly using diagram.

- a. In consolidated undrained test the pore pressure may be negative.
- b. Exit gradient will increase when vertical cut-off walls are provided below the hydraulic structures
- c. The contact pressure beneath the footing will be uniform, in case of flexible footing on clay. (7)
- d. The liquid limits of an oven dried and air-dried organic soils are same. (7)

2. a. Define shrinkage limit. How it is determined in the laboratory. What is its significance. (7)

b. The dry unit weight of a sand sample in the loosest sample is 12.84 kN/m^3 and in the densest state is 22.69 kN/m^3 . Determine the relative porosity of this sand when it has porosity of 34%. Assume the specific gravity as 2.63. What is the implication of it? (7)

3. a. Discuss the factors affecting permeability of the soil. Prove that permeability of the stratified soil in horizontal direction is more than that in the vertical direction. (7)

b. An earth dam is built on an impervious foundation with a horizontal filter at the base near the toe. coefficient of permeability in the horizontal and vertical directions are 3.5×10^{-5} and 2.5×10^{-5} respectively. The full reservoir level is 27 m above the filter. A flow net constructed for the transform section of the dam consists of 5 flow channels and 16 equipotential drops. Estimate the seepage loss per meter length of the dam. (7)

4. a. Prove that the maximum vertical stress on a vertical line at a constant radial distance r from the axis of a vertical load is induced at the point of intersection of the vertical line with a radial line at an angle of $39^\circ 15'$ from the point of application of concentrated load. What will be the value of shear stress at this point? (7)

B. Explain modified Proctor's test. How compaction energy is estimated. (7)

5. a. What is time factor. How it is related to the average degree of consolidation. (7)

b. Differentiate log of time fitting and square root of time fitting methods for the determination of coefficient of consolidation. Which method is more suitable when a soil exhibit high secondary consolidation? (7)

6. a. In a consolidation test, a fully saturated clay sample was subjected to a load of 500 kN/m^2 . After 10 minutes the average pore pressure was found to be 200 kN/m^2 . Find out the time required for 50% consolidation to take place. (7)

b. Two identical soil specimens were tested in a triaxial apparatus. The first specimen failed at a deviator stress 870 kN/m^2 when the cell pressure was 200 kN/m^2 . The second specimen failed at a deviator stress of 1400 kN/m^2 under cell pressure of 400 kN/m^2 . Draw Mohr's circle and determine the shear parameters. (7)

7. Write short notes on followings-

(4x3.5 = 14)

a. Clay minerals

c. Quick sand phenomena

b. Frost action in soil

d. Mechanism of shear strength

Total No. of Pages 02

FIFTH SEMESTER

END TERM EXAMINATION

Roll No.

B. Tech. (Civil)

January-2021

CE-302 Hydraulics and Hydraulic Machines

Time: 3:00 Hours

Max. Marks : 70

Note: Answer any *FIVE* questions.

Assume suitable missing data, if any.

- 1[a] what is open channel and classify the flows in an open channel? (4)
- [b] What is critical depth? Derive an expression for critical depth and critical velocity (5)
- [c] For a trapezoidal channel of most economical section, prove that half of top width = length of one of the sloping sides. (5)
- 2[a] The width of a horizontal rectangular channel is reduced from 3.5m to 2.5m and the floor is raised by 0.25m in elevation at a given section. At the upstream section the depth of flow is 2m. If the drop in the water surface elevation at the contraction is 0.2m, calculate the discharge if the energy loss is neglected. (10)
- [b] Define the terms (i) Afflux (ii) conveyance of a channel (2,2)
- 3[a] Water flows at the rate of $1\text{m}^3/\text{s}$ along a channel of rectangular section, 1.75 m in width. Calculate the critical depth if a hydraulic jump is formed at a point where the upstream depth is 0.25m, what would be the rise in water level and power lost in the jump? (10)
- [b] What is hydraulic jump? What are its classification? (4)
- 4[a] Find the length of the backwater curve caused by an afflux of 2.0 m, in a rectangular channel of width 40 m and depth 2.5 m. The slope of the bed is given as 1 in 11000. Take Manning's constant $N=0.03$. (10)
- [b] (i) What do you mean by 'Most economical section' of an open channel? (2)
- (ii) What is specific energy curve? (2)

5[a] A jet of water of diameter 50 mm, having a velocity of 20m/s strikes a curved vane which is moving with a velocity of 10m/s in the direction of the jet. The jet leaves the vane at an angle of 60° to the direction of motion of vane at outlet. Determine:

(i) The force exerted by the jet on the vane in the direction of motion.

(ii) Work done per second by the jet. (10)

[b] Explain the different types of efficiency of a turbine. (4)

6[a] A centrifugal pump with 1.2m diameter runs at 200rpm and pumps 1880 litres/s, the average lift being 6m. The angle which the vanes make at exit with the tangent to the impeller is 26° and the radial velocity of flow is 2.5m/s. Determine the manometric efficiency and the least speed to start pumping against a head of 6m, the inner diameter of the impeller being 0.6m. (10)

[b] Define slip, percentage slip and negative slip of a reciprocating pump. (4)

7 write short notes on

4x3.5=14

(i) Draft tube

(ii) Specific speed of turbine

(iii) Air vessel

(iv) Ogee spillway

— 61 —

VIIth SEMESTER

B.Tech. CIVIL ENGINEERING

END SEMESTER EXAMINATION

Jan-2021

CE-401

Design of Concrete Structure

Time: 3:00 Hours

Max. Marks: 100

Note: Answer any four questions.

All questions carry equal marks.

Use of IS 456:2000 is permitted

Assume suitable missing data, if any.

Q.1 a.) Explain the term partial safety factor for load and partial safety factor for material. also write values recommended by IS 456:2000.

(05)

b.) Discuss the assumptions of Limit states method? (05)

c.) What do you understand by durability? how it is accounted by IS 456:2000. (05)

c.) Write down the procedure involved in design for shear. (10)

Q.2 a.) Determine moment of resistance of RC beam having effective depth of 300 mm and width of 230 mm. it is reinforced with 3-12 mm bars. grade of concrete used is M-25 and grade of steel is fe-415. (15)

b.) How two-way slab is different from one-way slab? (05)

c.) What do you understand by effective length of column? (05)

Q.3 a.) Design a slab resting on masonry wall (230 mm thick) on all four sides, dimension of slab being 8m x 3.5m. use concrete of grade M-25 and fe-415 steel. (20)

b.) What is importance of bearing capacity of soil in design of footing. (05)

P.T.O.

- Q.4 a.) Design an axially loaded column with spiral reinforcement subjected to the load of 1500 kN? (15)
- b.) show that limiting depth of neutral axis is $0.48 d$ for fe-415. (10)

Q.5 Write short note on any four of the following: (4x)

- a.) water cement ratio
- b.) yield line theory
- c.) working stress method
- d.) effective span
- e.) strut tie model

~~53~~ - 63 -
Total No. of Pages _____

Roll No.

1 SEMESTER

B.Tech. old Scheme

END SEMESTER EXAMINATION Dec/Jan-2021

PAPER CODE CO-116

TITLE OF PAPER- Programming Fundamentals

Time: 3:00 Hours

Max. Marks : 70

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 keywords and identifiers? Give suitable examples
- [b] Differentiate between while and do-while loop with example.
- [c] Write a program to find the greatest of 3 numbers.
- Q.2[a] Explain Arithmetic operators in details.
- [b] Write a program to check a number is prime or not.
- [c] Explain the syntax of printf() function.
- Q.3[a] Write a program to print n terms of Fibonacci series.
- [b] What is a pointer variable? Create a pointer variable *ptr to int i and print value of i using ptr.
- [c] What is structure in C? give example.
- Q.4[a] Write a program to swap two numbers.
- [b] Explain four basic data types in C.
- [c] Differentiate (i) ++a and a++ (ii) = and ==
- Q.5[a] Write a program to sort an array.
- [b] Explain switch statement.
- [c] Explain nesting if statements.

CO-202 ANALOG ELECTRONICS

Time: 3 Hours

Max. Marks: 70

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

Question No. 1

[7+7=14]

- a] Discuss the Zener and Avalanche breakdown.
b] The circuit in Fig.1 has to be designed to make $V_o = 0\text{ V}$ and $V_{CEQ} = 3\text{ V}$. Determine R_C and R_E . Give $\beta = 200$.

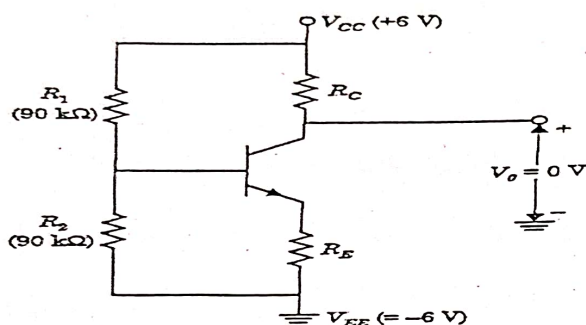


Fig.1

Question No. 2

[14]

Consider a transistor circuit with $\beta_F = 99$ and negligible reverse saturation current is used in circuit as shown in Fig.1. the element values are $V_{CC} = 10\text{ V}$, $R_C = 2.7\text{ k}\Omega$ and $R_F = 180\text{ k}\Omega$, and V_{BE} is open circuited.

- a] Determine the value of V_{CE} and I_C .
b] For β_F increased to 199, repeat [a].

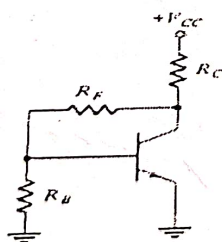


Fig.2

Question No. 3

[7+7=14]

- a] Why output characteristic of CE configuration have slope in active region while in CB configuration it doesn't have?
b] Derive the expression for current gain, input resistance, voltage gain, and output resistance of CC configuration with R_E having $r_b = 0$, and $r_o = \infty$.

P.T.O.

Question No. 4

Consider a CE amplifier as shown in Fig.3 uses a transistor with $\beta = 100$ and $V_A = 100V$ [7x2=14]

- [a] Determine the dc bias current I_E .
- [b] Determine R_i , voltage gain, current gain.

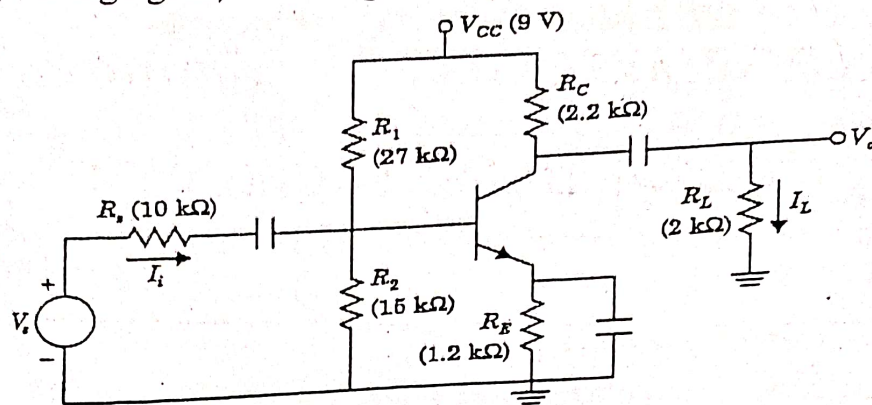


Fig.3

Question No. 5

- [a] Explain characteristic of MOSFET.
- [b] Derive the expression for voltage gain and output resistance for common source amplifier with source resistance.

Question No. 6

- [a] Discuss the comparison of BJT and FET.
- [b] An n-channel JFET, having $V_p = -4V$ and $I_{DSS} = 10mA$, is used in the circuit of Fig parameter values are $V_{DD} = 18V$, $R_S = 2kΩ$, $R_D = 2kΩ$, $R_1 = 450kΩ$ and $R_2 =$ Determine I_D and V_{DS} .

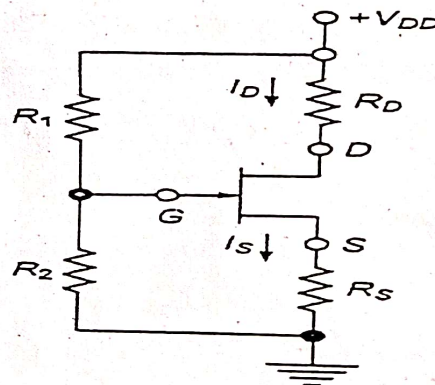


Fig.4

Question No. 7

Write the short notes on any **TWO** of the following:

- [a] Output characteristic of CE and CB configuration of BJT.
- [b] Voltage series and Current series feedback oscillator.
- [c] Operational amplifier as a summer and differentiator circuit.

SEVENTH SEMESTER EXAMINATION

January-2021

CO4043 DIGITAL IMAGE PROCESSING

Time: 3:00 Hours

Max. Marks: 70

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

- Q.1[a] What do you mean by digital image processing? Explain the different steps involved with the help of block diagram.
- [b] The size of an image is M pixel wide and N pixel high. The image is scanned at 300 dpi. The physical size of the scanned image is 8X8 inches. Find the value of M and N.
- Q.2[a] What is meant by image histogram of a digital image? How the contrast of the image is related to the histogram? Give explanation with proper expressions.
- [b] Perform histogram equalization for 3-bit grey image of the size 8×8 given in Table I.

Table I

Grey levels	0	1	2	3	4	5	6	7
Number of pixels	8	10	10	2	12	16	4	2

- Q.3[a] Justify the fact that a mean filter can be useful in Gaussian noise removal, while a median filter fails to do so.
- [b] Design an adaptive median filter and describe it's working.

Q.4[a] What is meant by sharpening of digital images? Explain the high-boost filtering.

[b] Define fuzzy logic and compare with classical logic. Also define INTERSECTION operation of two fuzzy sets.

Q.5[a] Define Coding Redundancy. Also, explain the functional block of a general compression system.

[b] Define gradient of an image. Also, Explain, how Laplacian operator can be used for sharpening of an image.

Q.6 Write short notes on any *TWO* of the followings

[a] Blind de-convolution

[b] Intensity and spatial resolution

[c] Sobel edge detector

[d] Un-sharp masking

Total no. of pages: 02

FIRST SEMESTER
END SEMESTER EXAMINATION

EE-105: Electrical Sciences

Roll No:.....
B.Tech [OLD SCHEME]

JANUARY- 2021

Time: 3:00 hours

Max Marks:70

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

- (a) State and illustrate with the help of an example the Maximum Power Transfer theorem.
(b) What do you understand by Independent & dependent Electrical Sources. Explain the classification of these sources.
- (a) Draw the power triangle. Define the Active, Reactive & Apparent Powers.
(b) Find the equivalent values of resistances for a star connected load from a given delta connected load.
- (a) Give the statement of Tellegen's Theorem. Prove it by taking suitable example.
(b) Draw the Thevenin's Model for the following circuit (fig.1)

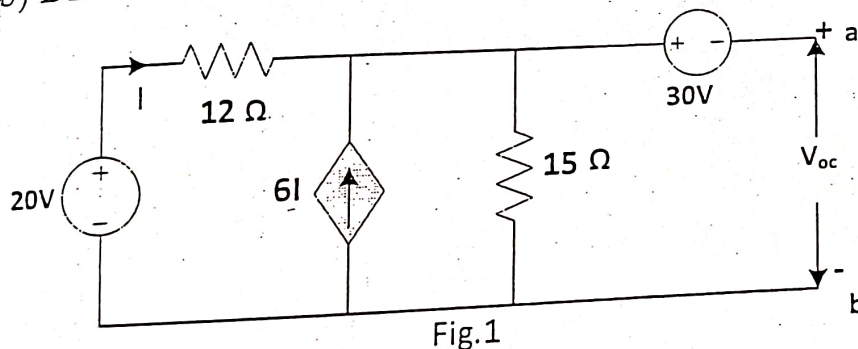


Fig.1

- (a) Find the Voltage across 25Ω Resistance using Norton's Theorem (fig.2)

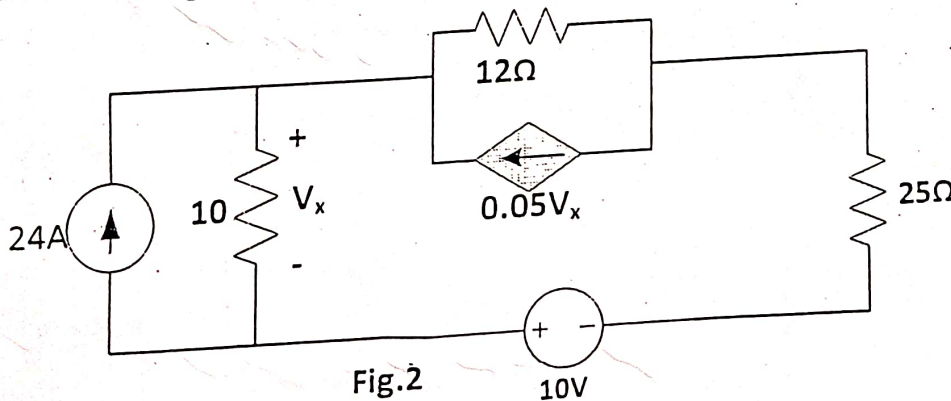


Fig.2

- (b) Draw the phasor diagram for the following circuit diagram.(fig.3)

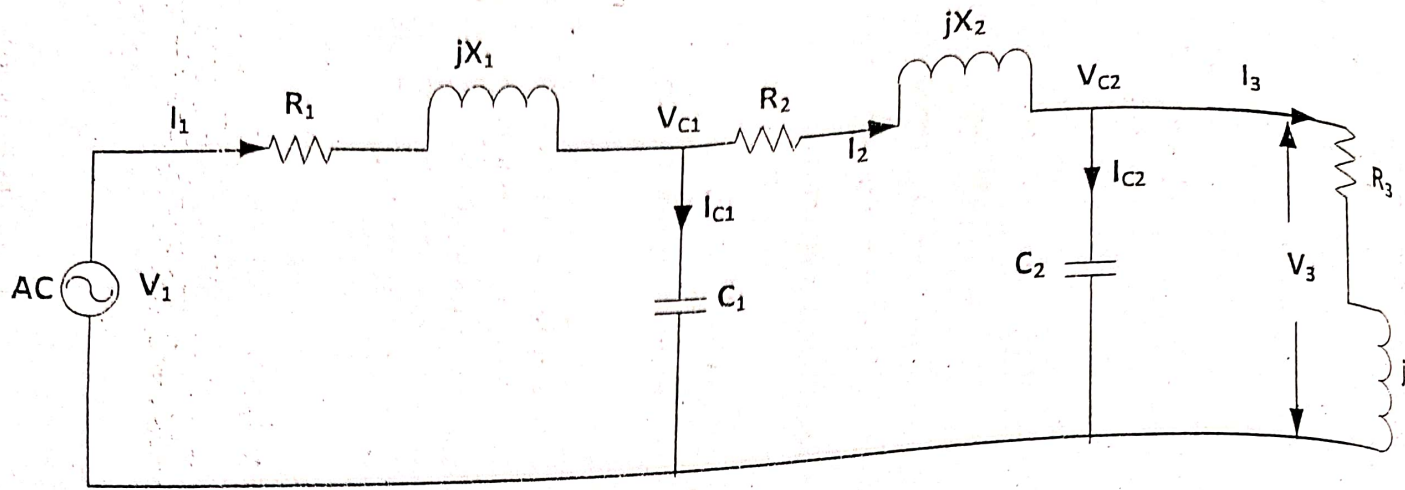


Fig. 3

5. (a) Define bandwidth, quality factor, half power frequencies in a series RLC circuit. Also explain the relationship between these.
- (b). Explain the phenomenon of Parallel Resonance in an electrical circuits.
6. (a) Describe the Two-wattmeter method of power measurement for a three-phase star connected system with lagging power factor.
- (b) In a two wattmeter of power measurement, the total power consumed by a star-connected load is 45 kW. Find the readings of each wattmeter if the power factor of load is 0.8 lagging.
7. (a) Explain in detail the Iron loss & copper loss in a transformer.
- (b) Derive the condition for maximum efficiency of a transformer.
8. Write short notes on any two of the following:-
 - (i) Single phase Auto-transformer, (ii) Moving coil instruments,
 - (iii) Analogies between Magnetic and Electrical circuits.
 - (iv) Digital voltmeter, (v) Moving iron instruments.

Total No. of Page 2

Roll No.

B.Tech.

Sem - I

END SEMESTER EXAMINATION

EN - 112 ENVIRONMENTAL SCIENCE

Time: 3:00 Hours

Max. Marks: 70

Note: Answer any 5 questions.
All questions carry equal marks.
Assume suitable missing data, if any.

1. (a) Define atmosphere along with its major layers? State their respective altitudes, temperature and chemical species with suitable diagram. (7)
(b) Define ecosystem and explain the difference between food chain and food web with appropriate example. (7)
2. (a) With a neat sketch of water cycle, explain the difference between global water cycle and biological water cycle? (7)
(b) Classify the air pollutants on the basis of state of matter? What are the various adverse effects of air pollution on human health? (7)
3. (a) Describe different conservation approaches to conserve biodiversity in India. (7)
(b) What are the types, sources and different methods for the disposal of solid wastes? (7)
4. (a) Mention the noise standards prescribed by CPCB for different zone along with its control measures. (7)

- (b) Explain the difference between conventional and non-conventional sources of energy. (7)
5. (a) What is sewage? Briefly discuss the chemical properties of waste water. (7)
(b) What are green house gases? Name and discuss their contribution to global warming and its effects on global climate. (7)
6. Write short notes on any four of the followings: (14)
 - (a) Chipko movement
 - (b) BOD and COD
 - (c) Air quality index
 - (d) Sustainable development
 - (e) Abiotic components
 - (f) Trophic levels

END SEMESTER EXAMINATION

IT-106 Fundamentals Of Information Technology

Time: 3:00 Hours

Max. Marks : 70

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

- Q.1 [a] Expand $A'B+BC'$ to maxterms and minterms.
[b] Explain in detail the instruction cycle in a computer.

(2x7=14)

- Q.2 [a] Draw the level 0 and 1 DFD diagram of online student registration system.
[b] Explain the working of a SR flipflop, show how it can be used as memory circuit.

(2x7=14)

- Q.3 [a] Reduce the following expression using K-map and implement it in universal logic.

$$F(A,B,C,D)=M(1,4,5,7,11,12,15)$$

- [b] Implement the following function using 4X1 and 8X1 MUX
 $F = (0,3,5,6,8,11)$

(2x7=14)

- Q.4[a] What is topology and architecture of a computer network?
Compare star, bus, tree and mesh topologies.

- [b] Explain with the help of suitable diagram the OSI model of computer networks

(2x7=14)

- [b] Why do computer networks use different types? (2x7=14)

- Q.6[a] What are modulation techniques in communication networks?
Explain amplitude modulation with help of suitable diagrams and equations.

- [b] What are high and low level languages? Differentiate between assembler, interpreter and compiler. (2x7=14)

- Q.7 Write short notes on ANY TWO

(7X2)

- [a] Combinational circuits
[b] lossy and lossless compression
[c] Adder and subtractor

END

Total no. of Pages: 02

FIRST SEMESTER

END SEMESTER EXAMINATION

AM - 101

Roll no.

B.Tech.

JAN 2021

MATHEMATICS - I

Time: 3:00 Hours

Max. Marks : 50

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

Q.1

a) Test the convergence of the following series

$$\frac{1}{2} + \frac{2}{3}x + \left(\frac{3}{4}\right)^2 x^2 + \left(\frac{4}{5}\right)^3 x^3 + \dots$$

b) Expand $\cos x$ in powers of $(x - \frac{\pi}{2})$ and determine the value of $\cos 91^\circ$ correct upto four decimal places.

Q.2

a) Examine the function $\sin x + \sin y + \sin(x + y)$ for extreme points and also find the value of the function at those points.

b) If $u = \operatorname{cosec}^{-1} \left[\frac{x^{1/2} + y^{1/2}}{x^{1/3} + y^{1/3}} \right]^{1/2}$, show that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} +$

$$y^2 \frac{\partial^2 u}{\partial y^2} = \frac{\tan u}{144} (13 + \tan^2 u).$$

Q.3

a) Change the order of integration in the integral and hence

$$\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dx dy \text{ and hence evaluate.}$$

b) Evaluate $I = \iiint \sqrt{1 - \frac{x^2}{a^2} - \frac{y^2}{b^2} - \frac{z^2}{c^2}} \, dx \, dy \, dz$ over

$$V = \left\{ (x, y, z); x \geq 0, y \geq 0, z \geq 0, \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} \leq 1 \right\}$$

Q. 4

- a) Find the area lying inside the curve $r = a \sin \theta$ and curve $r = a(1 - \cos \theta)$.
- b) Find the area of the surface formed by the revolution of $8x$ about the x -axis, by an arc from the vertex to one latus rectum.

Q. 5

- a) Find the directional derivative of the function $f = 2z^2$ at the point $P(1, 2, 3)$ in the direction of the line is the point $(5, 0, 4)$. In what direction it will be maximum also the magnitude of this maximum.
- b) Verify Green's theorem in the plane for $\oint_C \{(3x^2 - 4y - 6xy)dy\}$ where C is the boundary of the region $y = x$ and $y = x^2$.

Q. 6

- a) Find the total work done in moving a particle in a force $3xy \hat{i} - z\hat{j} + 10x \hat{k}$ along the curve $x = t + 1$, $2t^3$ from $t = 1$ to $t = 2$.
- b) Prove that $\text{Curl}(\text{Curl } \vec{V}) = \text{grad div } \vec{V} - \nabla^2 \vec{V}$

Total No. of Pages: 2

IIIrd SEMESTER

END SEMESTER EXAM

Roll No.....

B. Tech. (MC)

(JANUARY-2021)

MC 201: Mathematics-III

Time: 3:00 Hours

Max. Marks: 70

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

Q1. (i) Examine the absolute convergence of the improper integral

$$\int_1^{\infty} \frac{\sin x}{x^p} dx$$

(ii) Show that the integral $\int_{-1}^1 \frac{1}{x^3} dx$ exist in Cauchy principal value sense but not in general sense.

Q2. (i) Find the values of z for which the function

$$z = \sinh u \cos v + i \cosh u \sin v$$

ceases to be analytic?

(ii) If $u = y^3 - 3x^2y$ is a harmonic function, then find the corresponding analytic function $f(z)$.

Q3. (i) Find the value of $\oint (5x + 6y)dx + (3x - 4y)dy$ around a triangle in the xy -plane with vertices at $(0,0)$, $(4,0)$, $(4,4)$.

(ii) If $u(x, y) = \frac{x^3 - y^3}{x^2 + y^2}$ and $v(x, y) = \frac{x^3 + y^3}{x^2 + y^2}$, when $(x, y) \neq (0,0)$ and

$u(x, y) = v(x, y) = 0$, when $(x, y) = (0,0)$ then find the value of $f'(0)$ along x -axis.

P.T.O.

Q4. (i) Show that the transformation

$$w = \frac{2z+3}{z-4}$$

maps the circle $x^2 + y^2 - 4x = 0$ onto the straight line $4u + 3 = 0$ and explain why the curve obtained is not a circle?

(ii) Find the Laurent's series expansion of function $f(z) = \log z$ when in the region $|z - 1| < 1$.

Q5. (i) State convolution theorem for Z-transform. Verify convolution theorem when $\{f_n\} = \{n\}$ and $\{g_n\} = \{n^2\}$.

(ii) Solve by using Z-transform, the difference equation

$$y_{k+2} + 6y_{k+1} + 9y_k = 2^k, (y_0 = y_1 = 0)$$

End

Total page: 02
THIRD SEMESTER
END SEMESTER EXAMINATION

Roll No:.....
B.Tech. (MC)
January -2021

MC - 202

DIFFERENTIAL EQUATIONS

Time Allowed: 3 HOURS

Max. Marks: 70

Note: Attempt ALL questions by selecting any TWO from each question. All questions carry equal marks. Assume missing data if any.

1. (a) Solve all eigen values and eigen functions of the Sturm-Liouville Equation

$$y'' + \lambda y = 0, \text{ given that } y(-l) = y(l), y'(-l) = y'(l).$$
- (b) Form the partial differential equation from the relation

$$\phi(x^2 + y^2 + z^2, z^2 - 2xy) = 0.$$
- (c) Form the partial differential equation from the solution

$$z = f(x^3 + 2y) + g(x^3 - 2y).$$
2. (a) Solve the partial differential equation $z = p^2 + q^2.$
- (b) Solve $px + qy = pq$ by Charpit's method.
- (c) Solve $x(y^2 + z)p + y(x^2 + z)q = z(x^2 - y^2).$
3. Solve any two the following by the method of separation of variables.
 - (a) $4 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u(x, y)$ subject to the condition $u(0, y) = 3e^{-y} - e^{-5y}.$
 - (b) $\frac{\partial u}{\partial x} = \frac{\partial u}{\partial t} + u,$ given that $u(x, 0) = 3e^{-4x}.$
 - (c) $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2},$ given that $u(x, 0) = \sin \pi x.$

P. T. O

4. Solve any two of the following PDE.

(a) $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial^2 z}{\partial x \partial y} = \sin x \cos 2y$

(b) $(4D^2 - 4DD' + D'^2)z = 16 \log_e(x + 2y)$

(c) $(D^2 - D'^2 - 3D + 3D')z = xy + 7$

5. (a) Solve $\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$ representing the vibration of a string of length l , fixed at both ends, subject to the boundary conditions $y(0, t) = 0$, $y(l, t) = 0$ and the initial conditions

$$y = y_0 \sin \frac{\pi x}{l} \quad \text{and} \quad \frac{\partial y}{\partial t} = 0 \quad \text{at } t = 0.$$

(b) A rod of length l with insulated sides is initially at a uniform temperature u_0 . Its ends are suddenly cooled to 0°C and are kept at that temperature. Prove that the temperature function is given by

$$u(x, t) = \sum_{n=1}^{\infty} b_n \sin \frac{n\pi x}{l} e^{-\frac{c^2 n^2 \pi^2 t}{l^2}} \quad \text{where } b_n \text{ is determined from } u(x, 0) = u_0.$$

(c) Classify the following PDE.

$$u_{xx} + 3u_{yy} - 2u_x + 24u_y + 5u = 0.$$

MC203(Old Scheme): Discrete Mathematics

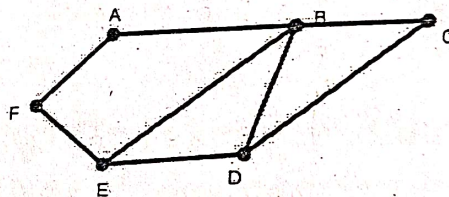
3 Hours

Max. Marks: 70

Instructions: Attempt any two parts of each question. All questions carry equal marks. Write neatly. Assume suitable missing data, if any?

- (a) In a competition, a school awarded medals in different categories. 36 medals in dance, 12 medals in dramatics and 18 medals in music. If these medals went to a total of 45 persons and only 4 persons got medals in all the three categories, how many received medals in exactly two of these categories?
- (b) Let the universe of discourse be $E = \{5, 6, 7\}$. Let $A = \{5, 6\}$ and $B = \{6, 7\}$. Let $P(x)$: x is in A , $Q(x)$: x is in B and $R(x, y)$: $x + y < 12$. Find the truth value of $(\exists x)(P(x) \rightarrow Q(x)) \rightarrow R(5, 6)$.
- (c) For (x, y) and (u, v) in \mathbb{R}^2 , define $(x, y)R(u, v)$ if $x^2 + y^2 = u^2 + v^2$. Prove that R defines an equivalence relation on \mathbb{R}^2 and interpret the equivalence classes geometrically.
- (a) Using indirect method show that $(r \rightarrow \bar{q}, r \vee s, s \rightarrow \bar{q}, p \rightarrow q) \rightarrow \bar{p}$.
- (b) Using predicate calculus show that the premises "Everyone in this college has purchased a computer" and "Hari is a student in this college" imply the conclusion "Hari has purchased a computer".
- (c) Prove by truth table $\neg(p \leftrightarrow q) \leftrightarrow ((\neg p \vee \neg q) \wedge (p \vee q))$.
- (a) Use rules of inference to check the validity of the following argument.
"If the train arrives late and there are no taxis at the station, then John is late for his meeting. John is not late for his meeting. The train did arrive late. Therefore, there were taxis at the station."

- (b) Suppose a student wants to make up a schedule for a seven-day period during which she will study one subject each day. She is taking four subjects: mathematics, chemistry and economics. Find the number of schedules that devote at least one day to each subject.
- (c) Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0, \quad n \geq 2, \quad a_0 = 1, \quad a_1 = 2$.
4. (a) Define Lattice and give an example of it. Discuss its properties.
- (b) Define Boolean algebra and give an example of it. Discuss its properties.
- (c) Define semigroup, monoids and groups with examples.
5. (a) Show that a simple graph is connected if and only if it has a spanning tree.
- (b) Define adjacency and incidence matrices of a graph. Find adjacency and incidence matrices for the following graph.



- (c) Let x, y, z be Boolean variables. Use the rules of Boolean algebra to reduce the following expression into its simplest form.
- $$(x \wedge z) \vee (\bar{y} \vee (\bar{y} \wedge z)) \vee ((x \wedge \bar{y}) \wedge \bar{z}).$$

~End~

MC-205 Probability and Statistics

Time: 3 hours

Max Marks: 70

Use of probability distribution tables and scientific calculator is allowed.

Q1 The hats of n persons are thrown into a box. The persons then pick up their hats at random (i.e., so that every assignment of the hats to the persons is equally likely). What is the probability that

- every person gets his or her hat back?
- the first m persons who picked hats get their own hats back?
- everyone among the first m persons to pick up the hats gets back a hat belonging to one of the last m persons to pick up the hats?

Now assume, in addition, that every hat thrown into the box has probability p of getting dirty (independently of what happens to the other hats or who has dropped or picked it up). What is the probability that

- the first m persons will pick up clean hats?
- exactly m persons will pick up clean hats?

Q2a What is the expected sum of the numbers that appear when three fair dice are rolled?

Or

For a coin that comes up heads independently with probability p on each flip, what is the variance in the number of flips until the k th head appears?

Q2b Ten competitors in a musical test were ranked by the three judges A, B, and C in the following order:

Ranks by A	1	6	5	10	3	2	4	9	7	8
Ranks by B	3	5	8	4	7	10	2	1	6	9
Ranks by C	6	4	9	8	1	2	3	10	5	7

Using rank correlation method, discuss which pair of judges has the nearest approach to common likings in music

Q3a A batch of parts contains 100 parts from a local supplier of tubing and 200 parts from a supplier of tubing in the next state. If four parts are selected randomly and without replacement, what is the probability

P.T.O.

Roll No: _____
 U.Tech (MCE) (CIC) (Old Scheme)
 January 2021

18

Q3b A random variable with mean 50 hours. A battery is used until it fails; it is replaced by a new one. Assuming a stockpile of 25 batteries, the lifetimes of which are independent, approximate the probability that over 1100 hours of use can be obtained. (Using CLT).

Q3c Population studies of biology and the environment often tag and release subjects in order to estimate size and degree of certain features in the population. Ten animals of a certain population thought to be extinct (or near extinction) are caught, tagged and released in a certain region. After a period of time a random sample of 15 of this type of animal is selected in the region. What is the probability that 5 of those selected are tagged animals if there are 25 animals of this type in the region?

Q4a Explain the joint density function with the help of an example.

Q4b Ten cards numbered 1 through 10 are shuffled so that all orderings are equally likely, and they are turned up one at a time. We say that a match occurs if the first card is numbered 1, or if the second card is numbered 2, or ..., or the 10th card is numbered 10. That is to say, a match occurs if the i th card in the deck happens to be numbered i . Find the expected number of matches. Hint: consider the random variable

$$X_i = \begin{cases} 1 & \text{if the } i\text{th card is a match.} \\ 0 & \text{otherwise.} \end{cases}$$

and consider the sum $\sum_{i=1}^{10} X_i$

Also find the $\text{Cov}(X_1, X_2)$, the covariance of X_1 and X_2 . Use this to determine whether X_1 and X_2 are independent.

Q4c State and prove the Central Limit Theorem.

At 5% level of significance test whether the survey programme is effective.

Q5b A taxi company is to decide whether to purchase brand A or brand B tires for its fleet of taxis. To estimate the difference in the two brands an experiment is conducted using 30 tires of each brand. The tires are run until they wear out. The results are

Mean(A): 36,300km SD(A): 5000km
 Mean(B): 38,100km SD(B): 6100km

Compute a 90% confidence interval for $\mu_B - \mu_A$ assuming the populations to be normal. What do you conclude from the confidence interval obtained?

Q5d Calcium is an essential mineral that regulates the heart, is important for blood clotting and for building healthy bones. The National Osteoporosis Foundation recommends a daily calcium intake of 1000-1200 mg/day for adult men and women. While calcium is contained in some foods, most adults do not get enough calcium in their diets and take supplements. Unfortunately, some of the supplements have side effects such as gastric distress, making them difficult for some patients to take on a regular basis. A study is designed to test whether there is a difference in mean daily calcium intake in adults with normal bone density, adults with osteopenia (a low bone density which may lead to osteoporosis) and adults with osteoporosis. Adults 60 years of age with normal bone density, osteopenia and osteoporosis are selected at random from hospital records and invited to participate in the study. Each participant's daily calcium intake is measured based on reported food intake and supplements. The data are shown below.

Normal Bone Density:	1200	1000	980	900	750	800
Osteopenia:	1000	1100	700	800	500	700
Osteoporosis:	890	650	1100	900	400	350

Is there a statistically significant difference in mean calcium intake in patients with normal bone density as compared to patients with osteopenia and osteoporosis?

Total No. of Pages: 2

5th SEMESTER

END SEMESTER EXAMINATION

Roll No.....

B. Tech.

(JANUARY-2021)

MC 301: Modern Algebra
(Old Scheme)

Time: 3:00 Hours

Max. Marks: 70

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

- Q1. a) Define kernel of a homomorphism. State and prove first fundamental theorem of homomorphism of groups.
b) Show that a non-empty subset H of a group G is a subgroup of G if and only if $ab^{-1} \in H, \forall a, b \in H$.
c) Let H and K be finite subgroups of a group G such that HK is also a subgroup of G . Then show that
$$o(HK) = \frac{o(H)o(K)}{o(H \cap K)}$$
- Q2. a) Define the binary for the class of addition modulo n and multiplication modulo n and show that both form an Abelian group under the binary defined in it.
b) If G is a finite group and $a \in G$, then show that $o(a) \mid o(G)$, (i.e. order of a divides order of G).
c) Define a cyclic group with an example. Let G be a finite cyclic group of order n , then show that G has $\phi(n)$ generators.
- Q3. a) Prove that kernel of a ring homomorphism $f: R \rightarrow R'$ is an ideal of the ring R .

- b) Prove that $\mathbb{Z}[\sqrt{-3}]$ is not a U.F.D.
- c) Show that \mathbb{Z} , the ring of integers, is a PID.

- Q4.a) Let R be a ring such that $x^2 = x, \forall x \in R$, then prove that R is commutative.
- b) If R is a commutative ring with unity and P is an ideal of R . Then show that P is a prime ideal of R if and only if R/P is an integral domain.
 - c) Show that the intersection of two maximal ideals may not be maximal.

Q5.a) Prove that a finite integral domain is a field.

- b) Give examples of two polynomials $f(x), g(x)$ in $R[x]$ such that
 - i) $\deg(f(x) + g(x)) < \max(\deg f(x), \deg g(x))$.

- ii) $\deg(f(x)g(x)) < \deg f(x) + \deg g(x)$.

- c) Prove that the characteristic of an integral domain is either zero or a prime number.

- END -

Attempt any five questions. All question carry equal marks. Assume suitable missing data if

Determine the Optimal Solution of

$$\begin{aligned} \text{Max } z &= 2x_1 - 4x_2 + 5x_3 - 6x_4 \\ \text{subject to } x_1 + 4x_2 - 2x_3 + 4x_4 &\leq 2 \\ x_1 - 2x_2 - 3x_3 - 4x_4 &\geq -1 \\ x_1, x_2, x_3, x_4 &\geq 0. \end{aligned}$$

Solve the following integer programming problem

$$\begin{aligned} \text{Max } z &= x_1 + x_2 \\ \text{subject to } 6x_1 - 5x_2 &\leq 6 \\ 10x_1 + 12x_2 &\leq 6 \\ x_1, x_2 &\geq 0 \end{aligned}$$

x_1 and x_2 are integers.

Draw a critical-path arrow diagram and indicate the critical path. What is the minimal time required for completion?

Job	Description	Immediate Predecessors	Time(minutes)
A	Design flowchart and write statements	-	170
B	Punch control cards	A	40
C	Punch comment cards	A	30
D	Punch programme cards	A	50
E	Obtain brown folder	B,C,D	20
F	Put deck together	B,C,D	40
G	Submit deck	E,F	20

A steel company has three open sources and five destinations. The transportation cost for shipping steel from sources to destinations are shown in the following table:

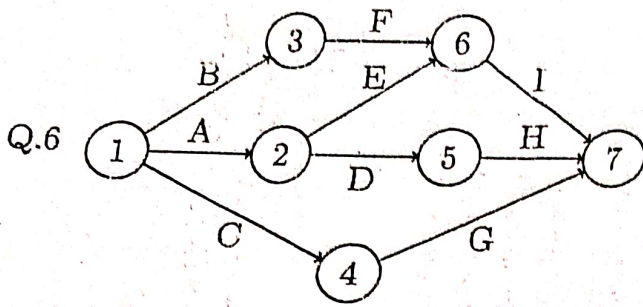
	M_1	M_2	M_3	M_4	M_5	$a_i \downarrow$
F_1	5	2	4	2	7	8
F_2	5	5	6	2	1	12
F_3	8	5	4	8	4	14
$b_j \rightarrow$	4	4	6	8	8	

What is the optimal shipping schedule?

Four different jobs can be done on four different machines. The setup and take down time costs are assumed to be high for change overs. The matrix below gives the cost in rupees of producing job-i on machine-j.

	M_1	M_2	M_3	M_4
M_1	5	7	11	6
M_2	8	5	9	5
M_3	4	7	10	8
M_4	10	4	8	3

How should the jobs be assigned to the various machines so that the total cost is minimised?



Task	A	B	C	D	E	F	G	H	I
Least time	5	18	26	16	15	6	7	7	7
Greatest time	10	22	40	20	25	12	12	9	8
Most likely time	8	20	33	18	20	9	10	8	8

Determine the following:

- Expected task time and their variance.
- The earlieset and latest expected times to reach each node.
- Critical path.

Q.7 Apply the principle of duality to solve the LP problem by 2 Phase method:

$$\begin{aligned}
 &\text{Max } z = 4x_1 - 3x_2 \\
 &\text{subject to } x_1 + x_2 \leq 6 \\
 &\quad x_1 \leq 4 \\
 &\quad x_2 \geq 1 \\
 &\quad x_2 \leq 5 \\
 &\quad x_1, x_2 \geq 0.
 \end{aligned}$$

Total no. of pages :2
5th SEMESTER
END SEMESTER EXAMINATION

Roll No. _____
B.Tech (MC- Engg.)
Jan 2021

MC – 303 Financial Engineering

Time : 3 hrs

Max. Marks: 70

Note: Q.No.1 is compulsory, answer any other three questions.
Statistical table is allowed. Assume missing data, if any.

1. (a) The current price of gold is Rs.25000 per 10 gm. The storage cost is Rs.200 per gm per year payable quarterly in advance. Assuming that constant interest rate of 9% compounded quarterly, calculate the forward price of gold for delivery in nine months. 4
- (b) A non-dividend paying stock is currently selling at Rs. 100 with annual volatility 20%. Assume that the continuously compounded risk-free interest rate is 5%. Using a two period CRR binomial option pricing model, find the price of one European *call option* on this stock with a strike price of Rs. 80 and time to expiration 4 years. 6
- (c) Consider a portfolio of two assets a_1 & a_2 with no short sell, with the following statistical parameters $\mu_1=5\%$, $\mu_2=10\%$, $\sigma_1=10\%$, $\sigma_2=40\%$, $\rho_{12} = -0.05$. Find the value of minimum risk, the expected return and weight of the assets. 6
- (d) The stock price is Rs.100. The annual continuously compounded risk free interest rate is 5% and the annual volatility relevant for the Black Scholes formula is 30%. Call options are written with a strike price of Rs.80 and time to expiration of 5 years. The stock will pay a dividend of Rs.20 In 2 years and another dividend of Rs. 30 in 3 years. Use the Black – Scholes formula to find the price of one such call option. 6
- (e) Find the stochastic differential equation of $\cos(W(t))$ using Ito – Doebelin formula of version two. 6
2. (a) Define risk neutral probability, obtain its expression. Prove that under risk neutral probability after nth period $E\{S(n)\} = S(0)[1 + r]^n$, where 'r' is risk free interest rate. 7

- (b) Let $S(0) = \$50$, $r = 5\%$, $u = 0.3$ and $d = -0.1$. Find the price of a European call and put with strike price $X = 60$ dollars to be exercised after $N = 3$ time steps using CRR- formula. 7

3. (a) Let $\{S_n, n=0,1,2,\dots\}$ be a symmetric random walk and F_n be a filtration. Show that $Y_n = (-1)^n \cos(\pi S_n)$ is a martingale with respect to F_n . 7

- (b) Evaluate $\int_0^T W(t) dW(t)$ using quadratic variation. 7

4. (a) A stock being sold for Rs.45 and risk free interest rate is 6% and assume that a dividend of Rs.2 is paid after six months. Find the forward price of the contract on this stock with a delivery date as one year. Also find its value after nine months, the stock price at that time happen to be Rs.50. 7

- (b) State and prove the Put – Call parity formula for European call and put option, with current price of stock $S(0)$ and exercise price X and exercise time T . 7

5. (a) For two asset portfolio prove that the variance of the portfolio can not exceed the greater of the variances σ_1^2 & σ_2^2 of the component assets, if there is no short sell. 7

- (b) Using the following data: 7

Scenario	Probability	Return K1	Return K2
ω_1 (recession)	0.4	-10%	20%
ω_2 (stagnation)	0.2	0%	20%
ω_3 (boom)	0.4	20%	10%

Find the weights in a portfolio with expected return $\mu_p = 26\%$ and compute the risk of this portfolio

Total No. of Pages: 03

Roll No. _____

SEMESTER

B.Tech. (MC)

END SEM EXAMINATION (OLD SCHEME)

JAN-2021

MC 402 APPLIED GRAPH THEORY

Time: 3:00 Hours

Max. Marks: 70

Note: Ques 1 is compulsory. Answer any 4 questions from the remaining questions. Assume suitable missing data, if any.

1 [a] State whether given statement is True or False. Give reason. (10)

- i. There exists a graph with 5 vertices v_1, v_2, v_3, v_4, v_5 such that $d(v_1) = 3, d(v_2) = 4, d(v_3) = 3, d(v_4) = 2, d(v_5) = 1$.
- ii. Each vertex in a complete bipartite graph has the same degree.
- iii. There exists a bipartite graph with a cycle of length 5.
- iv. All graphs must have edges.
- v. There exists a cycle C of length four with chromatic number, $\chi(C) = 3$.

[b] Draw a graph which is:

(4)

- i. Hamilton and Eulerian
- ii. Hamilton and non-Eulerian
- iii. Non-Hamilton and Eulerian
- iv. Non-Hamilton and non-Eulerian

Q.2 [a] When is the complement of a disconnected graph disconnected?
Is the statement below true or false?

"At least one of a graph or its complement is connected."

If it is true prove it; if it is false provide a counterexample.

[b] Define Perfect Matching in a graph. How many perfect matchings are possible in the following graphs:

- i. K_{2n} , a complete graph
- ii. C_{2n} , a cycle

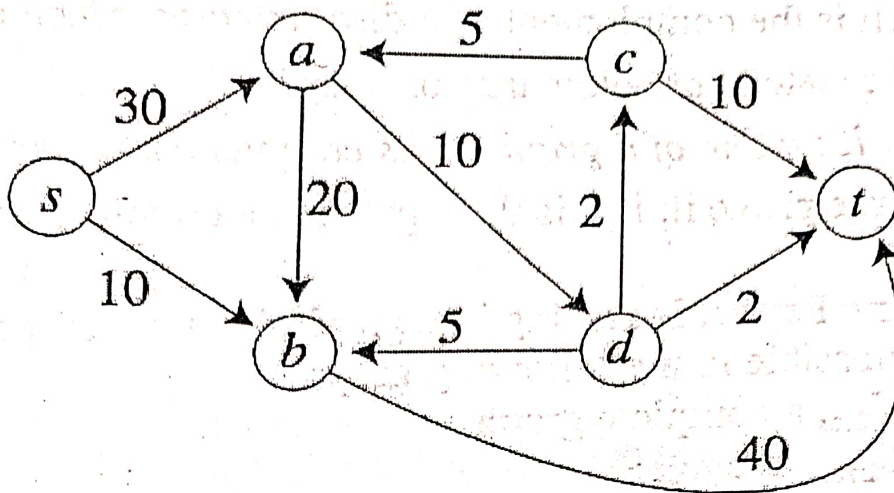
Q.3 [a] Prove that a tree with n vertices has $(n-1)$ edges.

[b] Prove that a graph is bipartite if and only if its chromatic number is two.

Q.4 [a] Prove that with respect to a given spanning tree T , a chord c_i that determines a fundamental circuit Γ occurs in every fundamental cut associated with branches in Γ and no other.

- [b]
- i) Prove that a graph is bipartite if and only if it has no odd cycle
 - ii) Show that a finite simple graph with more than one vertex has at least two vertices with the same degree.

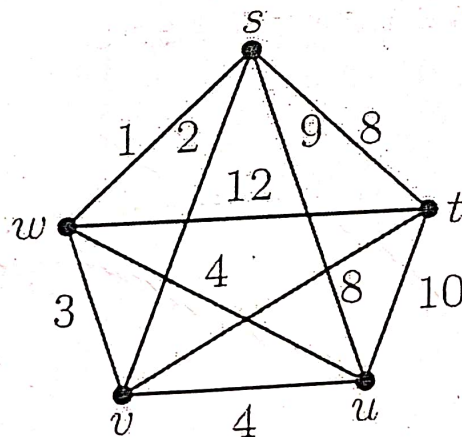
Q.5 [a] Use Ford-Fulkerson Algorithm to find maximum flow from s to t .



- [b]
- Is the degree sequence $(6, 5, 5, 5, 4, 4, 2, 1)$ graphical.
 - Show that it is not possible to have a group of 7 persons such that each knows exactly 3 persons in the group. (4+3)

[a] Every graph $G(V, E)$, $|V|=n$, $|E|=m$ with $m \geq n - 1$ is either connected or contains a cycle. (7)

[b] Explain Kruskal's Algorithm and use it to find the minimal spanning tree in the graph below: (7)



Attempt any five questions. All question carry equal marks. Assume suitable missing data if

- (a) What do you mean by transitive closure of a fuzzy relation $\tilde{R}(X, X)$?
 (b) Compute transitive max-min closure $\tilde{R}_T(X, X)$ for the fuzzy relation $\tilde{R}(X, X)$ given as:
- $$\begin{pmatrix} 0.7 & 0.6 & 0.4 & 0 \\ 0 & 0.3 & 0 & 1 \\ 0.4 & 0.5 & 0 & 0 \\ 0 & 0.6 & 0.9 & 0 \end{pmatrix}$$

Let $X = \{1, 2, 3, \dots, 10\}$. \tilde{A} , \tilde{B} and \tilde{C} be fuzzy sets on X as given below
 $\tilde{A} = \{(1, 0.7), (2, 0.5), (3, 0.9), (4, 0.8), (5, 0.5), (6, 0.4), (7, 0.6), (8, 0.9), (10, 1)\}$
 $\tilde{B} = \{(x, \mu_{\tilde{B}}(x) = (1 + (x - 10)^{-1})\}$

$\tilde{C} = \{(x, \mu_{\tilde{C}}(x)) | x \in R\}$ where $\mu_{\tilde{C}}(x) = \begin{cases} 0 & x \leq 10 \\ (1 + (x - 10)^{-2})^{-1} & x > 10 \end{cases}$

Determine (a) $\tilde{A} \cup \tilde{B} \cup \tilde{C}$ (b) $\tilde{A} \cap \tilde{B} \cap \tilde{C}$

Define Resolution form of a fuzzy relation. Given the resolution form of following fuzzy relation.

$$\tilde{R} = \begin{pmatrix} 1 & 0.7 & 0 & 0.1 & 0.3 \\ 0.7 & 1 & 0.4 & 0 & 0.8 \\ 0 & 0.4 & 1 & 0 & 0 \\ 0.1 & 0 & 0 & 1 & 0.6 \\ 0.3 & 0.8 & 0 & 0.6 & 1 \end{pmatrix}$$

Compose the following two fuzzy relations \tilde{R}_1 on $X \times Y$ and \tilde{R}_2 on $Y \times Z$ by using the

(i) Max-min composition

(ii) Max-product composition

$$\tilde{R}_1 = \begin{pmatrix} 0.9 & 0.1 & 0.7 & 0.5 & 0.9 \\ 0.2 & 0 & 0.9 & 0.4 & 0.7 \end{pmatrix}, \quad \tilde{R}_2 = \begin{pmatrix} 0 & 0.6 & 1 \\ 0.9 & 0.8 & 1 \\ 0.6 & 0.2 & 0.6 \\ 0.1 & 0 & 0.8 \\ 0.6 & 1 & 0.3 \end{pmatrix}$$

Are both compositions equal? If not, give reason.

- (a) Let $X = \{1, 2, 3, 4, 5, 6, 7, 8\}$ be a universal set and let $\tilde{A} = \{(4, 0.8), (5, 1), (6, 0.4)\}$ and $\tilde{B} = \{(6, 0.7), (7, 1), (8, 0.2)\}$ be subsets on X .
 Calculate $\tilde{A} + \tilde{B}$, $\tilde{A} - \tilde{B}$, $\tilde{A} \cdot \tilde{B}$

- (b) Let $f(x) = 1/2, x \in X$ then evaluate $\int_{\tilde{A}-\tilde{B}}^{\tilde{A}+\tilde{B}} f(x) dx$.

Consider the fuzzy equation $(1, 5, 6) = (2, 4, 6) \oplus \tilde{X}$ and check which one is best approximation $\tilde{X}_1 = (-1, 1, 1)$ or $\tilde{X}_2 = (-1, 1/2, 1/2)$. Justify your result.

Q.7 (a) Calculate the following:

(i) $[-1,3] + [1,5]$

(ii) $[-2,5] - [2,6]$

(iii) $[-2,4] \cdot [3,6]$

(iv) $[-4,8] / [3,2]$

(b) Explain fuzzy controller and give suitable example.

Total No. of Page-01

- 92 -

FIRST SEMESTER

END SEMESTER EXAMINATION

Roll No.....

B. Tech. OLD SCHEME

Jan 2021

ME-115

Basic Mechanical Engineering

Time: 3:00 Hours

Maximum Marks: 70

Note: Answer any FIVE questions.

- 1 (a) Explain quasi-static process, thermodynamic equilibrium and intensive and extensive properties. Give examples. 7
(b) Explain first law of thermodynamics for a system undergoing a cycle and undergoing a process. 7
- 2 (a) Derive steady flow energy equation and show its application for a steam turbine. 7
(b) Air flows steadily at the rate of 0.5 kg/s through an air compressor, entering at 7 m/s velocity, 100 kPa pressure, and 0.95 m³ /kg volume, and leaving at 5 m/s, 700 kPa, and 0.19 m³ /kg. The internal energy of the air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in the compressor jackets absorbs heat from the air at the rate of 58 kW. (a) Compute the rate of shaft work input to the air in kW. (b) Find the ratio of the inlet pipe diameter to outlet pipe diameter. 7
- 3 (a) Derive an expression for the efficiency of an otto cycle in terms of compression ratio and ratio of specific heats (i.e. $\gamma = C_p / C_v$). 7
(b) (i) What is Newton's law of viscosity? (ii) Give difference between ideal and real fluids (iii) Define Bernoulli's theorem and write its equation. 7
- 4 (a) What is welding? Explain the different welding processes. 7
(b) Explain casting process with an example. 7
- 5 (a) Explain any four turning operation with examples. 7
(b) Explain drilling operation with example. 7
- 6 (a) Explain the need of quality measurement for manufacturing processes. 7
(b) Explain the use of micrometer with an example. 7

Total No. of Pages 1
FIFTH SEMESTER
END SEM EXAMINATION

Roll No.
B.Tech.(ME)
Jan, 2021

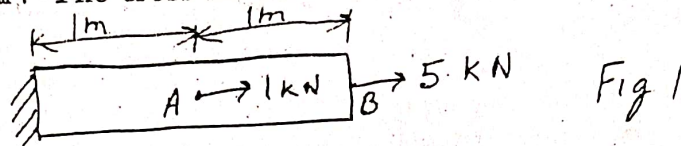
ME-304 MECHANICS OF SOLIDS

Max Marks : 70

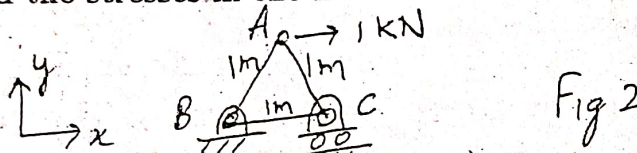
Time: 3 hrs

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

- 1(a) For the bar shown in Fig. 1, find the change in length. What is the strain energy stored in the bar? The cross-sectional area is 1 cm^2 , $E = 210 \text{ GPa}$.



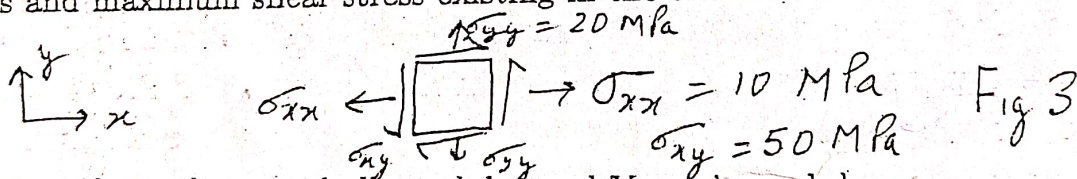
- (b) Find the stresses in the members of the truss shown in Fig. 2.



- 2(a) Draw stress-strain diagram of mild steel. Discuss strain hardening, necking, yield point and ultimate tensile strength.

- (b) Find maximum shear stress and twist per unit length for a torque of 5 kNm for a solid circular rod of radius 10 cm . The shear modulus of material is 90 GPa .

- 3(a) Fig. 3 shows a state of plane stress for an element. Find normal and shear stresses on a plane whose normal makes an angle of 30° with x-axis. Find principal stresses and maximum shear stress existing in the element.



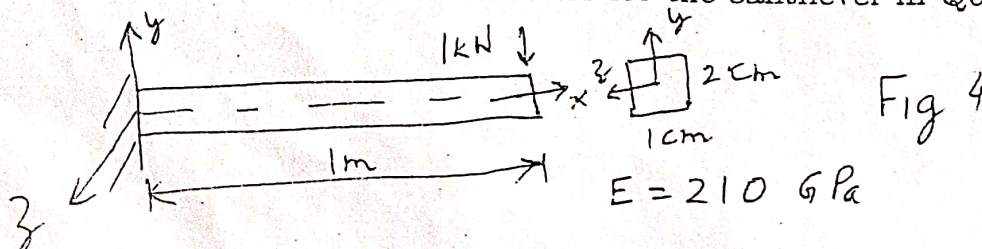
- (b) Derive relation between bulk modulus and Young's modulus.

- 4(a) An aluminum bar of rectangular cross-section ($30 \text{ mm} \times 60 \text{ mm}$) and length 2 m is fixed at the base and free at the top. $E = 70 \text{ GPa}$. Determine the Euler buckling load.

- (b) Find radial and tangential stresses at inner and outer radii in a close-ended thick cylinder of outer radius 1 m and thickness 0.25 m for an internal pressure 5 MPa .

- 5(a) For the cantilever shown in Fig.4, determine the support reactions and draw bending moment and shear force diagrams.

- (b) Find maximum deflection and maximum stress for the cantilever in Q5(a).



ME-402 MACHINE DESIGN-II(Old Scheme)

Time: 3 hr
Max. Marks: 70

Note: Attempt any FIVE questions. Use of Design data hand book is permitted

A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20° , while the helix angle is 25° . The face width is 40mm and the normal module is 4mm. The pinion as well as gear is made of steel 40C8 (ultimate stress=600MPa) and heat treated to surface hardness of 300BHN. The service factor and factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power capacity of gears. [14]

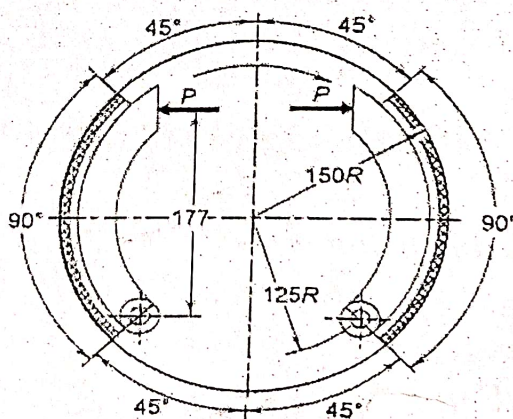
- (a) Derive the expression for a virtual number of teeth for a bevel gear. [5]
(b) A pair of bevel gears, with 20° pressure angle, consists of a 20 teeth pinion meshing with a 30 teeth gear. The module is 4 mm, while the face width is 20mm. The material for pinion and gear is steel 50C4 (Ultimate tensile strength = 750N/mm^2). The gear teeth are lapped, and ground (Class-3) and the surface hardness is 400BHN. The pinion rotates at 500 rpm and receives 2.5kW power from the electric motor. The starting torque of the motor is 150% of the rated torque. Determine the factor of safety against bending failure and against pitting failure. [9]

- (a) What are the four important parameters that are required to specify the worm gear drive? [4]
(b) A pair of worm and worm wheel is designated as 2/52/10/4. It supply 10kW power at 720 rpm to the worm shaft. The coefficient of friction is 0.04 and the pressure angle is 20° . Calculate the tangential, axial and radial components of the resultant gear tooth force acting on the worm wheel. [10]

- (a) Plot the variation of coefficient against bearing characteristic number (ZN/p) for journal bearings. Discuss stable and unstable lubrication. [5]
(b) Design a journal bearing to support a load of 7500N while the shaft runs at 800rpm using a hardened steel journal and bronze backed babbitt bearing. The clearance is 0.002cm per cm diameter, and the ambient temperature is 29°C . select suitable oil and check whether artificial cooling is necessary. [9]

P.T.O.

- (5) Design a connecting rod for a high-speed IC engine using the following data:
 Cylinder bore=125mm, length of connecting rod =300mm, maximum pressure=3.5MPa, Length of stroke=125mm, Mass of reciprocating parts=1.6kg, engine speed=2200rpm with an overspeed 3000rpm. assume that the connecting rod is made of SAE1045 steel with UCS of 660MPa and UTS of 580MPa.
- (6) Design a plain carbon steel centre crankshaft for a single acting four-stroke engine for the following data:
 Bore=400mm, Stroke=600mm, Engine speed=200rpm, Mean effective pressure=0.5N/mm², Maximum combustion pressure=2.5N/mm², Weight of flywheel used as a pulley=50kN, Total belt pull 6.5kN. When the crank has turned through 90° from the top dead centre, the pressure on the piston is 1N/mm², and the torque on the crank is maximum. The ratio of connecting rod length to the crank radius is 4.
- (7) An automotive-type internal-expanding brake is shown in figure 1. The face width of friction lining is 50 mm and the coefficient of friction is 0.4. The maximum intensity of pressure on the lining is 0.8 N/mm². The angle θ_1 can be assumed to be zero. Calculate
 (i) the actuating force;
 (ii) the torque capacity of the brake.



Figure(1)

Total No. of Pages -1

Roll No.

III SEMESTER (Production)

B.Tech.

END SEMESTER EXAMINATION

Jan-2021

PE-205

FLUID SYSTEMS

Time: 3 Hours

Max. Marks: 70

Note: Answer all question by Selecting any two parts from each questions. All questions carry equal marks.

Assume suitable missing data, if any.

- 1 (a) Define the following: Atmospheric pressure, Gauge pressure, Vacuum pressure and Absolute pressure. 7
- (b) Compare Path line, Streak line, stream lines and stream tubes 7
- (c) The diameter of a pipe 10 cm and velocity of fluid in the pipe is 2 m/s find the rate of flow. 7
- 2 (a) Drive an expression for Bernoulli's equation and List the assumptions which are made while deriving Bernoulli's equation. 7
- (b) Differentiate between Venturi-meter and Orifice-meter 7
- (c) Define and explain Geometric similarity, Kinematic similarity and Dynamic similarity. 7
- 3 (a) Compare and contrast Laminar and Turbulent flow 7
- (b) What are the applications of Dimensional analysis? Explain one in detail 7
- (c) Differentiate between the turbines and pumps. 7
- 4 (a) Define laminar boundary layer, turbulent boundary layer and boundary layer thickness. 7
- (b) Explain characteristic curves of pumps with neat sketch. 7
- (c) List the valves used to control Pressure, flow and direction 7
- (a) Classify the hydraulic Turbines 7
- (b) Compare the hydraulic accumulator and hydraulic intensifier. 7
- (c) Define and explain Computational fluid dynamics and mention its applications 7

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

B Tech Third Semester

End Semester Examination

PE – 206:

Paper Code

Time: 3:00 Hrs.

Roll No.....

Production Engineering

(January-2021)

Engineering Mechanics

Title of the Subject

Max Marks. 70

Attempt any five Questions.
All Questions carry equal marks.
Assume missing data if any.

- 1- (a)- Differentiate between (2x7=14)
- (i) – Conditions of Equilibrium, for a Particle and a Rigid Body.
 - (ii) – Coefficient of Friction & Coefficient of Restitution.
 - (iii) – Parallel Axis Theorem and Perpendicular Axis Theorem.
 - (iv) – Absolute Motion and Relative Motion.
 - (v) – Plane Motion and Rotation.
 - (vi) – Direct & Oblique Impact.
 - (vii) – Linear Translation and Curvilinear Translation.

Two cables are tied together at A and loaded as shown in the following figure. Knowing that $P = 640$ N, determine the tension in each cable. (7)

- b) In the following figure the angle θ is such that the vector sum of the three forces is zero. Determine the moment of the three forces about A. (7)

- a) Reduce the force couple system, shown in the following figure, to a single force system. Also find out the perpendicular distance of the line of action of that single force from O. (7)

- b) A double pendulum is held in equilibrium in the position as shown in the following figure, by a horizontal force F . The balls B and C each weighs 15 N. Determine the force F , the tensions in the strings AB and BC and the angle θ . (7)

- (a) Three blocks of masses 120 kg, 160 kg and 200 kg are arranged on the top of a rough, rigid surface as shown in the following figure. The top block is retained against horizontal motion by a surrounding cap. Find the maximum value that the horizontal force P may have before motion begins. (7)

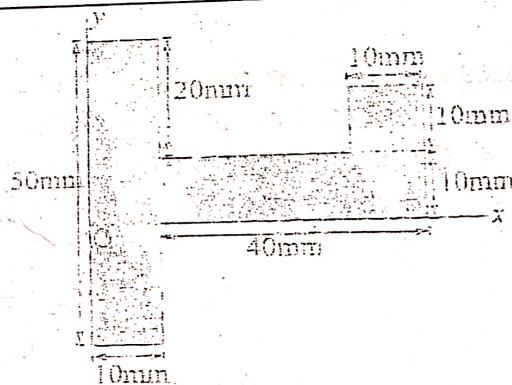
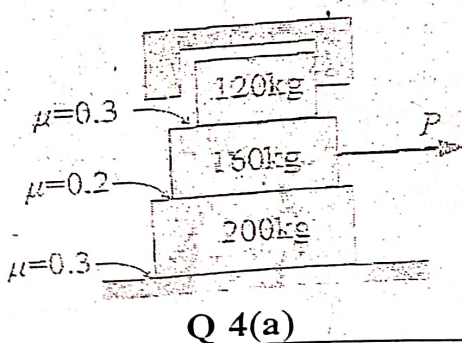
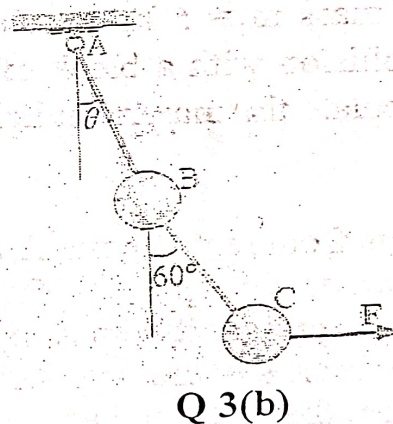
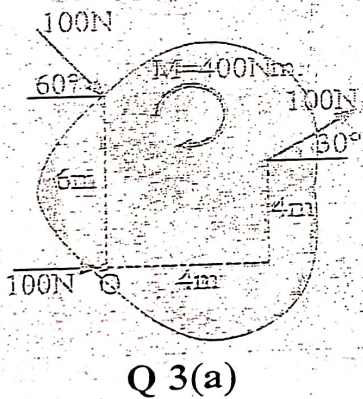
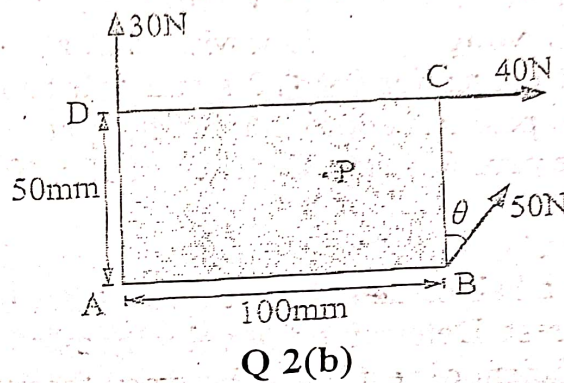
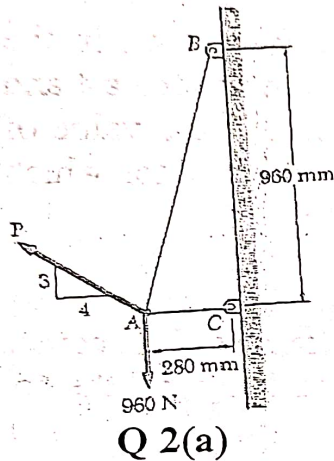
- Q 4 (b) A projectile is projected from a point on the level of the ground and it's height is h when it is at a horizontal distance l and $2l$ from it's point of projection. Prove that the velocity of projection u is given by $u^2 = \frac{g}{4} \left(\frac{4l^2}{h} + 9h \right)$
- Q 5 Find the moment of inertia of the following cross section of a Beam, about it's centroidal axis.
- Q 6(a) A particle moves in a straight line with the velocity shown in the following figure. Knowing that $x = -8$ m at $t = 0$, draw the a - t and x - t curves for $0 < t < 20$ s and determine (a) - the maximum value of the position coordinate of the particle, (b) the value of t for which the particle is at a distance of 18 m from the origin.
- Q 6 (b) A ball of mass 2 kg moving with a velocity of 3m/s impinges directly on a ball of mass 4 kg at rest. After impact the 2 kg mass ball comes to rest. Determine the velocity of 4 kg ball after striking and the coefficient of restitution between the two balls.
- Q 7(a) Consider a frictionless track ABC, as shown in the following figure. A block of mass $m_1 = 5$ kg is released from A. It makes a head on elastic collision with a block of mass $m_2 = 10$ kg at B, initially at rest. Calculate the maximum height to which m_1 will rise after the collision.
- Q 7 (b) A bus starts from rest at point A and accelerates at the rate of 0.75 m/s^2 , until it reaches the speed of 9m/s. It then proceeds at 9m/s until the brakes were applied; it comes to rest at point B, 27 m beyond the point where the brakes were applied. Assuming uniform deceleration and knowing that the distance between A and B is 180 m, determine the time required for the bus to travel from A to B. (7)
- Q 8 (a) A heavy uniform rope of length $2l$ hangs over a small smooth pulley, as shown in the following figure. The length $l+a$ being at one side and $l-a$ at the other side. If the end of the shorter portion be held and then let go, show that the rope will slip off the pulley in time:

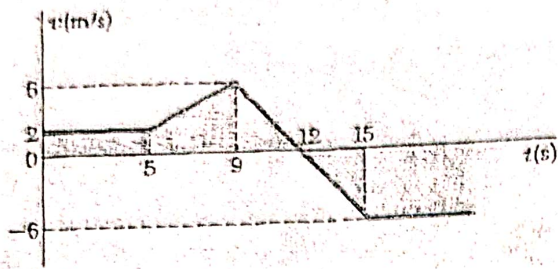
$$t = \sqrt{\frac{l}{g}} \log \left\{ \frac{l + \sqrt{l^2 - a^2}}{a} \right\}$$

- 8 (b) A load of 10 kN is raised by means of a screw jack, having a square threaded screw of 12 mm pitch, and of mean diameter 50 mm. If an effort of 100 N is applied at the end of a lever to raise the load, what should be the length of the lever used? Co-efficient of friction is 0.15. Also state whether the screw is self locking?

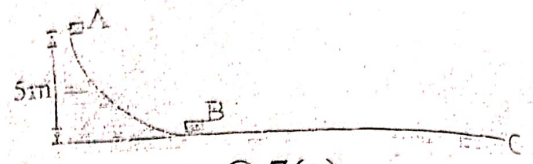
(7)

Figures of the Respective Questions

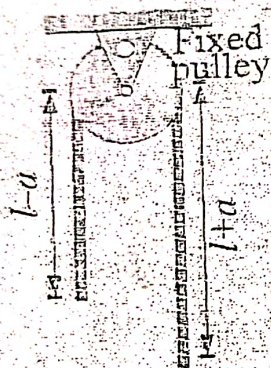




Q 6(a)



Q 7(a)



Q 7(b)

Sem - V

END SEMESTER EXAMINATION

JAN - 2021

METAL FORMING AND PRESS WORKING

Time: 3 hours

Max Marks: 70

NOTE : Attempt any five questions

All questions carry equal marks

Assume suitable missing data, if any.

- Q.1. Define yield strength, stress-strain relationship with respect to metal forming. Also elaborate the significance of these parameters in relation to metal forming and press working.
- Q.2. What is forging process? Explain various forging processes with neat sketches. Discuss forces and stresses during forging. Also elaborate applications and limitations of forging process.
- Q.3. a) Define metal forming and press working
b) How is metal forming process useful in precision sheet metal industries? Discuss in details with sketches.
- Q.4. Write short notes on:
- a) Swaging and its advantages
 - b) Upsetting and applications
 - c) Extrusion, its types and its applications
 - d) Explosive forming and its advantages
 - e) Electrohydraulic forming and its advantages
 - f) Turret Punch Press and its working operation
 - g) Press Brake; its working principle and operation
- Q.5. What are cold forming and hot forming processes? Explain rolling process in details with neat sketches giving emphasis upon the following :
- a) Roll separating forces
 - b) Friction through regulated opening
 - c) Shape and size of products
 - d) Applications
 - e) Limitations
 - f) Energy used
 - g) Mechanics involved

Q.6. Explain following operations with neat sketches

- a) Punching
- b) Blanking
- c) Notching
- d) Lancing
- e) Slitting
- f) Nibbling
- g) Trimming

Also discuss their applications and limitations.

PE 303 Production and operations Management

Time 3 Hours

Max. Marks: 70

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

1. Define production planning. Discuss objectives and pressure for which planning is considered to be essential in the operation of an industrial concern.
2. What is the importance of sales forecasting? Explain the judgmental forecasting techniques.
3. The sale of cycles in a shop in four consecutive months are given as 70, 68, 82, 95. Exponentially smoothing method with a smoothing factor is used in forecasting. What is the expected number of sales in the next month? How can you measure the forecasting errors?
4. Explain ABC analysis used in inventory control.
5. A factory requires 1500 units of an item per month, each costing Rs.27, the cost per order is Rs.150 and the inventory carrying charges works out to be 20% of inventory cost. Find out the economic order quantity and the number of orders per year. Would you accept 2% price discount on a minimum supply quantity of 1200 numbers? Compare the total cost in both cases.
6. Why is the line and staff organization preferred to the line type of organization in today's industry? Describe the implication of the relationship of staff departments with line departments.
7. Discuss the different types of plant layouts.
8. Explain briefly JIT manufacturing technique and KANBAN model.
9. What is assembly line balancing? Write their advantages.
10. Write short notes on process flow chart and VED inventory analysis.

FIFTH SEMESTER

B.Tech (AUTOMOBILE ENGG.)

END SEMESTER EXAMINATION

JANUARY 2021

PE-304 DESIGN OF MACHINE ELEMENTS

Time : 3 HOURS

Max. Marks: 70

Note: Attempt any 5V questions. Assume missing data, if any. Design data book is permitted for the examination

- 1a. Discuss about the manufacturing consideration in Machine design. 07
 1b. Define Factor of safety and discuss in detail about the factors contributing for deciding Factor of safety. 07

- 2a. Write a brief note on limits, fits and tolerances. 07
 2b. Discuss about manufacturing consideration in Machine design 07

3a. Design a cotter joint to connect a piston rod to the crosshead. The maximum steam pressure on the piston rod is 35 kN. Assuming that all the parts are made of the same material having the following permissible stresses:
 $\sigma_T = 50 \text{ MPa}$; $\tau = 60 \text{ MPa}$ and $\sigma_C = 90 \text{ MPa}$. 07

3b. Design a double riveted double strap butt joint for the longitudinal seam of a boiler shell, 750 mm in diameter, to carry a maximum steam pressure of 1.05 N/mm² gauge. The allowable stresses are :
 $\sigma_T = 38 \text{ MPa}$; $\tau = 21 \text{ MPa}$ and $\sigma_C = 42.5 \text{ MPa}$
 Assume the efficiency of the joint as 75%. 07

- 4a. Discuss in detail about different types of welded joints used in fabrication work. 07
 4b. Discuss the significance of the initial tightening load and the applied load so far as bolts are concerned. Explain which of the above loads must be greater for a properly designed bolted joint and show how each affects the total load on the bolt. 07

5. A flanged protective type coupling is required to transmit 50 kW at 2000 r.p.m.. Find :
 (a) Shaft diameters if the driving shaft is hollow with $d_i / d_o = 0.6$ and driven shaft is a solid shaft. Assume $\tau = 100 \text{ MPa}$.
 (b) Diameter of bolts, if the coupling uses four bolts. Take $\sigma_C = \sigma_T = 70 \text{ MPa}$ and $\tau = 25 \text{ MPa}$. Assume pitch circle diameter as about 3 times the outside diameter of the hollow shaft.
 (c) Thickness of the flange and diameter of the hub. Assume $\sigma_C = 100 \text{ MPa}$ and $\tau = 125 \text{ MPa}$.
 (d) Make a neat free hand sketch of the assembled coupling showing a longitudinal sectional elevation with the main dimensions. The other dimensions may be assumed suitably. 14

6. Power is transmitted between two shafts by a V-belt whose mass is 0.9 kg/m length. The maximum permissible tension in the belt is limited to 2.2 kN. The angle of lap is 170° and the groove angle 45°. If the coefficient of friction between the belt and pulleys is 0.17; find 1. velocity of the belt for maximum power; and 2. power transmitted at this velocity. 14

FIFTH SEMESTER
END SEMESTER EXAMINATION JAN 2021

B.Tech.(PE)

(Old Scheme)

PE 305 THERMAL SYSTEMS -III

Time : 3 hr

Max Marks: 70

Answer any **FIVE** questions. Assume missing data suitably if any.
Use of steam / RAC tables & psychrometric charts permitted.

1.(a) Explain working principle of four stroke SI engine with neat sketch. Draw the valve timing diagram also.

(b) Explain how two stroke CI engine works. Bring out clearly relative merits and demerits of SI and CI engines. (7,7)

2 Explain the following:

(i) Ignition delay and flame propagation in SI engines.

(ii) Pre ignition and abnormal combustion in SI engines. (7,7)

3(a) Explain the combustion chambers used in CI engine.

(b) Explain with a neat sketch of fuel injection system in CI engines. (7,7)

4(a) Discuss the merits and demerits of CNG and Producer gas fuels.

(b) Explain in brief (i) Biodiesel (ii) Alcohols (7,7)

5(a) What is refrigeration? Explain Air refrigeration system with a neat sketch and draw Ts diagram.

(b) Explain working principle of VCR cycle with a neat sketch. Draw TS and ph charts. What is vapour absorption system? (7,7)

of 15 TR capacity with the temperature difference of 5°C before entering the expansion valve and the vapour is dry saturated before leaving the evaporator. Determine (i) the mass of refrigerant to be circulated /min (ii) COP (iii) the power required in kW and heat removed in condenser in kJ/hr

(b) Explain any two psychrometric processes with sketch. (9,5)

7(a) Explain the winter air conditioning system with a neat sketch.

(b) In a laboratory test a psychrometer records : DBT = 30° C , WBT = 24° C. Determine the following: partial pressure of water vapour, specific humidity , relative humidity, Degree of saturation, DPT and enthalpy of moist air. (7,7)

Total no. of Pages 2
End Term Examination
Seventh Semester

Roll no.
January-2021
B.Tech.

PE 402 OPTIMIZATION TECHNIQUES

Marks: 70

Time: 3hrs

Q1. (a) Write Statement of an optimization problem. Write engineering applications of optimization.

Q1. (b) Classify the Optimization Problem. Explain any two of them.

Q2. (a) State four applications of linear programming.

Q2. (b) A manufacturing firm produces two machine parts using lathes, milling machines, and grinding machines. The different machining times required for each part, the machining times available on different machines, and the profit on each machine part are given in the following table.

Type of machine	Machining time required (min)		Maximum available per week (min)
	Machine part I	Machine part II	
Lathes	9	4	2500
Milling machines	3	9	2000
Grinding machines	1	1.5	450
Profit per unit	Rs. 500	Rs. 1000	

Determine the number of parts I and II to be manufactured per week to maximize the profit.

Q3. (a) Maximize $F = x_1 + 2x_2 + x_3$

subject to

$$2x_1 + x_2 - x_3 \leq 2$$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6$$

$$x_i \geq 0, i = 1, 2, 3$$

Q3. (b) By Graphical method Minimize $F = -3x_1 - 2x_2$

subject to

$$x_1 - x_2 \leq 1$$

$$3x_1 - 2x_2 \leq 6$$

$$x_1 \geq 0, x_2 \geq 0$$

Q4. (a) Five wagons are available at station 1,2,3,4 and 5. These are required at five stations I,II,III,IV,V. The mileages between various stations are given by the table

below. How the wagons should be transported so as to minimize the total mileage covered.

	I	II	III	IV	V
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

Q4. (b)

Turkish national swimming team coach is putting together a relay team for the 400 meter relay. Each swimmer must swim 100 meters of breaststroke, backstroke, butterfly, or free style. The coach believes that each swimmer will attain the time (seconds) given in the Table below. To minimize the team's time for the race, assign each swimmer for a stroke.

	Free	Breast	Fly	Back
PLAYER 1	54	54	51	53
PLAYER 2	51	57	52	52
PLAYER 3	50	53	54	56
PLAYER 4	56	54	55	53

Q5. (a) What is the difference between Fibonacci and golden section methods?

Q5. (b) Find the minimum of the function $f(\lambda) = 0.65 - 0.75/(1 + \lambda^2) - 0.65\lambda \tan(1/\lambda)$ using the secant method with an initial step size of $t_0 = 0.1$, $\lambda_1 = 0.0$, and $\epsilon = 0.01$.

Q6. (a) Use the method of steepest ascent to

$$\text{Minimize: } z = (x_1 - \sqrt{5})^2 + (x_2 - \pi)^2 + 10$$

Q6. (b) Explain KUHN-TUCKER Conditions. Give a suitable example.

Q7. (a) Define Geometric Programming. Explain the procedure and applications.

Q7. (b) Explain the procedure in Dynamic Programming with a suitable example.

Q8. Write Notes on

(a) Neural Network based optimization.

(b) Optimization Fuzzy Systems.

Total no of pages 02

B.Tech.

END SEMESTER EXAMINATION

Roll no.....

SEVENTH SEMESTER

Jan-2021

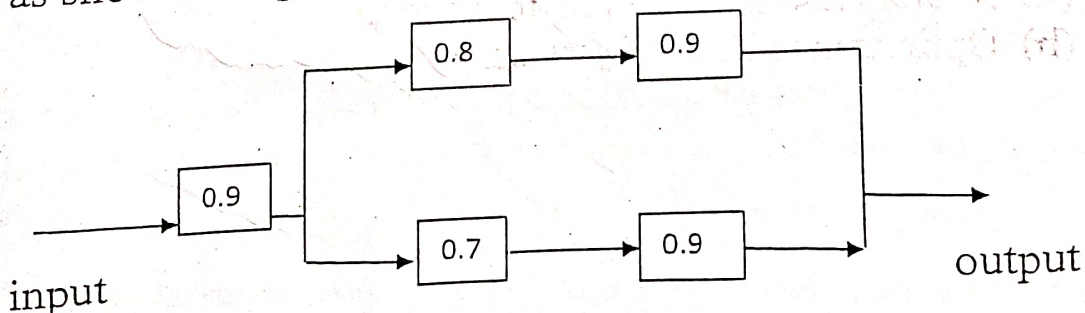
PE -4032- Reliability Engineering

Time: 3Hours

Max Marks: 70

NOTE: Answer Any five Questions.. Assume suitable missing data, if any.

- 1 Define and explain (i) Reliability (ii) availability (iii) MTTR (iv) Redundant system (v) stand by system (vi) Unit redundancy (vii) MTTF 14
- 2 (a) Explain reliability function, cumulative distribution function and probability density function. 7
(b) What is Hazard rate and failure rate? Derive relation in terms of reliability 7
- 3 (a) Explain below in terms of reliability testing (i) Burn in testing (ii) acceptance Testing (iii) Sequential testing (iv) Accelerated life testing (v) Reliability growth testing. 7
(b) Explain Markov graphs for single and two element system 7
- 4 (a) Explain series, parallel and mixed element configuration reliability with an example. 7
(b) Calculate the system reliability for the units connected as shown in figure. 7



- 5 (a) Explain tie set and cut set method 7
(b) Explain Constant and linearly hazard model 7
6 (a) Probability density function given by with (t) hours 7

$$f(t) = \begin{cases} .002e^{-0.002t} & t \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Determine (i) Reliability for t hours (ii) MTTF (iii) Median time to failure

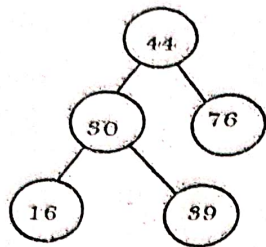
- (b) For a system composed of three elements in parallel, 7
determine system of reliability for 3000 hrs of
operation and Find MTTF. The three components have
identical failure rate of 0.0005 / hr and time of failure
distribution is exponential in each case. What is MTTF
of each case.

7 Write short note

- (a) Fault tree construction
(b) Reliability optimization and cost trade off.

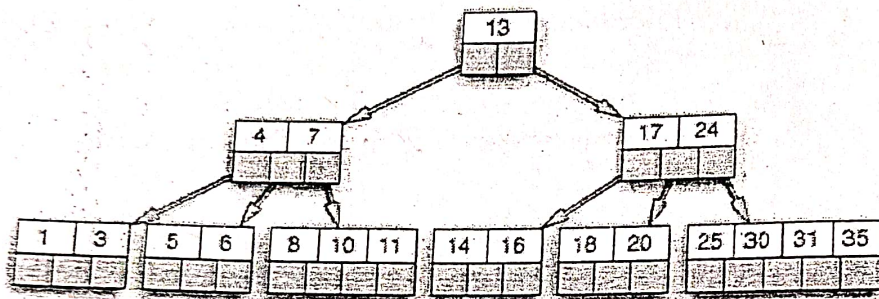
Note: Answer any five questions. Write pseudo code/C code for all algorithms asked. Assume suitable missing data, if any.

1. (a) Implement insertion sort using linked list to perform insertion sort as follows: remove an element from the input list and insert it to the correct position in the output linked list. Write an algorithm for this insertion sort to sort n elements stored in a linked list.
(b) Describe Overflow(stack full) and Underflow(stack empty) conditions in STACK data structure implemented (i) using array, (ii) using linked list. [6,4+4]
2. Consider a list of numbers: 62, 31, 70, 91, 25, 11, 9, 61, 73, 6
Show the result of inserting the numbers in the list in the same order specified above into an initially empty **minimum heap**. Note that you need to show how the heap looks like after each number is inserted. [14]
3. (a) Describe chaining method for hash table. What is load factor for hash table.
(b) Describe different methods for handling collision in Hash table. [8,6]
4. (a) Write an algorithm which checks if a given binary tree is a binary search tree (BST) or not. Algorithm should return true/false.
(b) Write an algorithm that takes two linked lists, sorted in increasing order and merge the two into one linked list which is in decreasing order, and return it. [7,7]
5. Write algorithm to evaluate a postfix expression using suitable data structure. [14]
6. (a) Write algorithm which takes input a binary search tree T and value K and returns K^{th} smallest number in binary search tree. Return 0 if tree contains less than K elements. (assuming BST does not contain key 0).
(b) Insert key 37 in following AVL tree and draw final AVL tree after required rotation(s) if any.



[7,7]

7. (a) Consider following B-Tree of degree 6 (max 6 children)



- (i) Draw tree after deleting key=6.
 - (ii) Draw tree after deleting key =16 (without applying (i) i.e. key=6 is still present in tree).
- (b) A given string contains all types of printable characters. Write an algorithm to remove all characters other than alphabets from string with fixed amount of additional storage area. (e.g. "He4l*I%=O" to be converted to "Hello"). What is time complexity of your algorithm? [4+4,6]
8. (a) Write an algorithm to count number of leaf nodes in a given binary tree.
- (b) Write an algorithm to concatenate two doubly linked lists L1 and L2. L1 and L2 are pointers to first node of linked lists respectively. After concatenation (L1 followed by L2), L1 points to first node of final linked list.

[7,7]

Total No. of Pages 2

Roll No.....

B.Tech.(SE)
Jan- 2021

V-SEMESTER
END SEMESTER EXAMINATION

SE-303 THEORY OF COMPUTATION

Max. Marks: 70

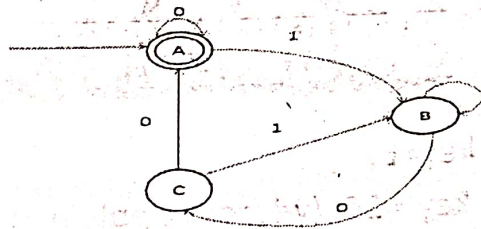
Time: 3:00 Hours

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

2X7=14

Q.No. 1

- A) Construct a DFA for strings over $\{0, 1\}$ having an even number of 0's and odd no of 1's.
- B) Construct a regular expression(RE) corresponding to the following FA using Arden's theorem



- C) Design a Mealy machine which reads the input from $(0 + 1)^*$ and produces following outputs:

- i. If input ends at 101, output is X
- ii. If input ends at 110, output is Y
- iii. Otherwise output is Z

2X7=14

Q.No. 2

- A) Construct a Turing machine that will recognize the language $L = \{0^n 1^n 2^n | n \geq 1\}$
- B) Given a regular expression $(10(00)^*1 + 01^*01)^*$. First construct NFA with null moves, then eliminate null moves from the same.
- C) Construct PDA for $L = \{x \in \{a, b, c\}^* | |x|_a + |x|_b = |x|_c\}$ by showing all δ -mappings. Also realize the same with the help of example.

2X7=14

No. 3

- A) What is pumping lemma for regular expression? Show that the language $L = \{0^i 1^i | i \geq 1\}$ is not regular.
- B) State and prove Pumping lemma for CFL.
- C) Explain applications of finite automata and CFG and Write CFG which accepts the language $L = \{0^i 1^j 0^k | j > i + k\}$

Q.No. 4

A)

- i. Convert the following grammar to CNF
 $S \rightarrow bA|aB$, $A \rightarrow bAA|aS|a$, $B \rightarrow aBB|bS|b$
- ii. Convert following CFG to GNF
 $S \rightarrow AB$, $A \rightarrow BS|b$, $B \rightarrow SA|a$

2X7=14

- B) Explain Myhill-Nerode Theorem and List algebraic laws for regular expressions.
- C) Explain following terms
- i. Recursive and recursive enumerable languages.
 - ii. Mealy and Moore Machines.

Q.No. 5

- A) State and prove equivalent of PDA with empty store and PDA with final state, and vice-versa
- B) What is Push down Automata? Design a Push down automata for the following grammar

2X7=14

$S \rightarrow aS|bA$, $A \rightarrow a|aS|bAA$, $B \rightarrow aBB|bS|b$

- C) Design Context Free Grammar(CFG) for the Language $L = \{0^n 1^m | n \neq m\}$.

Total no. of Pages: 02
End Semester Examination
Fifth Semester

JAN-2021

Roll no:
ODD-2020
B.Tech.(SE)

Paper Code: SE-305 Computer Network
(Old scheme)

Duration: 3 Hrs.

Max Marks: 70

NOTE: Attempt all the questions. Assume the missing data, if any.

Q1. Answer the following questions in brief: (7*2=14)

- What are two reasons for using layered protocols?
- Which control bit is involved in setting up a TCP session?
- List out the advantages and drawbacks of bus topology.
- Why do you require a limit on the minimum size of Ethernet frame?
- What is count to infinity problem?
- How can a device have more than one IP address?
- Is there any drawback of using piggybacking?

Q2. a) Differentiate between ISO-OSI and TCP/IP reference model.

(10)

b) List the advantages of fiber-optics over copper as a transmission medium.

(4)

Q3. a) Explain the working of 3 bit sliding window protocol with suitable example. (7)

b) Differentiate between Link state and Distance Vector Routing algorithm. (7)

Q4. a) Explain the following ARQ techniques in detail: (2*5)

- Stop and wait ARQ
- Selective repeat ARQ

b) What are the benefits of remote access VPNs? (4)

Q5. Explain the following terms (any two):

- DNS
- SSL
- Aloha
- Congestion control

P.T.O.
(7*2=14)

END

Total No. of Pages 2

Seventh SEMESTER
COMPUTING)

END SEMESTER EXAMINATION

Roll No.

B.Tech. (SOFT

(December-2020)

SE-4042 SOFT COMPUTING

Time: 3 Hour

Max. Marks: 70

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:

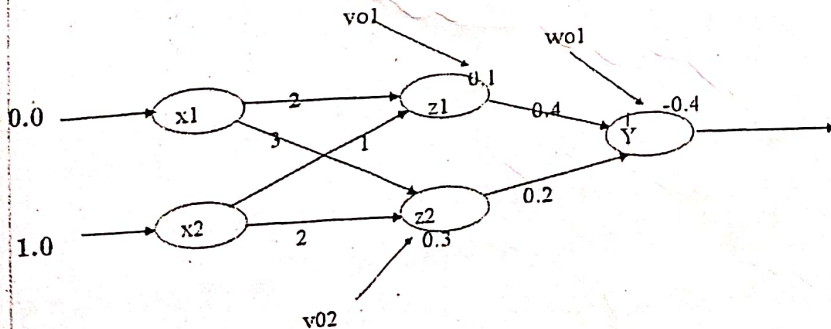
- a) Compare and contrast classic logic and fuzzy logic with an example.
- b) What is de-fuzzification? Why is it needed? Explain with suitable example.
- c) Enlist properties of Fuzzy set?
- d) What is soft computing?

[3+3+2+2=10]

2. a) What is ANN? Compare artificial neural networks with a biological neural network.

b) Apply the backpropagation Algorithm to find the final weights for the following net.

Input: $x = \{0.0, 1.0\}$, weights between hidden and output layer: $w = \{0.4, 0.2\}$, Bias on the output Node o and $w_o = \{-0.4\}$, weights between input and hidden layer : $v = \{2.1, 1.2\}$, Bias on hidden unit nodes are $v_o = \{0.1, 0.3\}$, Describe output : $d = 1.0$.



[7.5+7.5=15]

P.T.O.

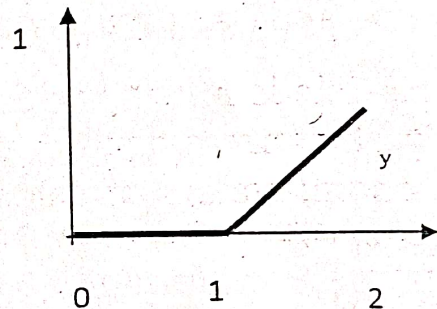
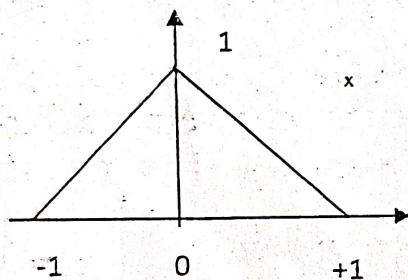
3. a) What is Genetic algorithm? Explain with flow chart.
 b) Explain with suitable examples linearly and non-linearly separable pattern classification.

[7.5+7.5=15]

4. a) Determine the crisp $\mu_j = 0.1$ for $j=0,1,\dots,10$ for the following fuzzy relation matrix R:

$$R = \begin{bmatrix} 0.2 & 0.7 & 0.4 & 1 \\ 1 & 0.9 & 0.5 & 0.1 \\ 0 & 0.8 & 1 & 0.6 \\ 0.2 & 0.5 & 1 & 0.3 \end{bmatrix}$$

- b) Consider a fuzzy system for the form $z = -x - y$, where the fuzzy inputs x and y have membership functions as shown in figure (a) and (b), below. Find the interval z and membership function μ_z for the fuzzy output z .



[7.5+7.5=15]

5. a) Using the genetic algorithm, minimize the objective function $f(x) = x^2 + x + 1$. Assume the necessary operator for the process on your own. Show the workspace with 10 population members, each of size 5 bits. $x \in [0, 5]$.

- b) Distinguish between supervised, unsupervised learning and reinforcement learning.

[7.5+7.5=15]

6. Answer any three

- Back-propagation network.
- Binary Hopfield Network
- Delta Learning Rule
- Explain different activation functions in NN

[5+5+5=15]

END

Total No. of Pages: 2

Roll No.

FIRST SEMESTER

B.Tech. (Eve) [CECE]

END SEMESTER EXAMINATION

(January-2021)

CECE-102 APPLIED PHYSICS

Time: 3 Hours

Max. Marks: 70

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

1. (a) What do you mean by Inertial frame of reference? Write down the expression of Galilean Transformation and its limitation. Derive the expression of velocity transformation under this transformation. [7]
(b) A particle is moving with SHM in straight line, when the distance of the particle from equilibrium position has the values x_1 and x_2 , the corresponding values of velocities are u_1 and u_2 . Show that the period is $2\pi \left[\frac{x_2^2 - x_1^2}{u_1^2 - u_2^2} \right]^{1/2}$. [7]
2. (a) Discuss the Michelson Morley experiment. Why the negative result of this experiment is having so importance in Physics. [7]
(b) At what velocity will the mass of a body is 2.25 times its rest mass. [7]
3. (a) What are the condition to achieve sustainable interference pattern? Derive the expression for maxima and minima due to in case of interference due to thin film of constant thickness in reflection mode. [7]
(b) Describe the Young's double slit experiment. Derive the expression for the intensity at a point in the region of superposition of two coherent waves of the same period and wavelength. [7]
4. (a) Discuss the difference between Fraunhofer and Fresnel Diffraction. Describe Fraunhofer Diffraction due to single slit and deduce the positions of maxima and minima Intensity. [7]
(b) Light of wavelength 550 nm falls normally on a slit of width 22.0×10^{-5} cm. calculate the angular position of first two minima on either side of central maximum. [7]

5. (a) Explain liquid drop model and derive the empirical formula for binding energy per nucleon by this model. [7]
(b) Describe construction, principle and working of a nuclear reactor. [7]
6. (a) A quantum mechanical particle is trapped in a infinite potential well. Derive the expression for allowed discrete energy for this case. [7]
(b) Explain the uncertainty principle for quantum mechanical particle. Discuss any one application of this principle. [7]
7. What are ultrasonic waves? Explaining the difference between Magnetostriction and Piezo-electric effects, describe the Piezo-electric generator method for production of ultrasonic waves. Discuss any two applications of ultrasonic waves. [1]
-

Total No. of Pages: 02

Roll No:

III SEM.

B.Tech.

January 2021

CECE – 301 Numerical Technique & Computer Programming

Time: 3 Hours

Max. Marks: 70

Note: Attempt all the questions by selecting any two parts from each question

- (1) (a) Express the following function and its differences in the factorial notation. $f(x) = x^4 - 12x^3 + 42x^2 - 30x + 9$
 (b) Solve the system of equations by Gauss-Seidel's method
 $8x - 3y + 2z = 20$; $4x + 11y - z = 33$; $6x + 3y + 12z = 35$.

(c) Show that $\left(\frac{\Delta^2}{E}\right)x^3 = 6xh^2$ and $E \equiv e^{hD}$

- (2) (a) Show that

$$\Delta^n \sin(ax + b) = \left(2 \sin \frac{a}{2}\right)^n \sin \left[ax + b + n \left(\frac{a + \pi}{2}\right)\right],$$

1 being the interval of differencing.

- (b) Use Gauss's backward formula and find the sales for the year 1986 given that

year	1951	1961	1971	1981	1991	2001
sales	12	15	20	27	39	52

- (c) Calculate the value of $f(7.5)$ for the table

x	1	2	3	4	5	6	7	8
f(x)	1	8	27	64	125	216	343	512

- (3) (a) In the following table, the values of y are consecutive terms of a series of which 23.6 is the 6 - th term. Using Newtons forward interpolation formula determine the first term of the series written as:

x	3	4	5	6	7	8	9
y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

- (b) Use Stirling formula to compute y_{28} from the following table:

x	20	25	30	35	40
y_x	49225	48316	47236	45926	44306

(c) Apply *Bessels* formula to obtain y_{25} given

$$y_{20} = 2854; y_{24} = 3162; y_{28} = 3544; y_{32} = 3992$$

(4) (a) Use *Lagranges* formula to calculate $f(9)$ from the following values:

x	5	7	11	13	17
F(x)	150	392	1452	2366	5202

(b) Use *Runge-Kutta* method of fourth order to solve the differential equation

$$\frac{dy}{dx} = (y^2 - x^2)/(y^2 + x^2),$$

with $y(0) = 1$ at $x = 0.2, 0.4$ and $h = 0.2$.

(c) Solve by *Gauss-Seidel* method of iteration the equations

$$10x + y + z = 12$$

$$2x + 10y + z = 13$$

$$2x + 2y + 10z = 14$$

(5) (a) Explain the following in detail with examples:

(i) Object program and source program.

(ii) STOP and END.

(iii) Logical IF statement and Arithmetic IF statement.

(b) The score of a team is given and the team is graded as per rule

- Grade = 1.0 if score ≥ 90
- Grade = 2.0 if score ≥ 80
- Grade = 3.0 if score ≥ 65
- Grade = 4.0 if score < 65

Draw a flowchart to find the grade of a team.

(c) For a given set of 50 numbers WAP to print those pairs which add up to 23.

Total No. of Pages: 1

—121—

THIRD SEMESTER

OLD SCHEME END EXAMINATION

CECE-302 ELECTRICAL & ELECTRONICS ENGINEERING

Time: 3:00 Hours

Roll No.

B.Tech. (Evening)

JAN-2021

Max. Marks: 70

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

Q (1) (a) Define and explain the terms "Electric current", "Electric potential", power, and energy and give their units. (10M)

(b) State and explain with neat diagram Kirchhoff's laws for electric circuits.

Q (2) Consider a series-parallel combination of resistors as shown in Figure 1. Find the equivalent resistance as seen from terminals A-B. (b) Determine the current I and power P delivered by a 10-V dc voltage source applied at terminals A-B, with A being at higher potential than B. (10M)

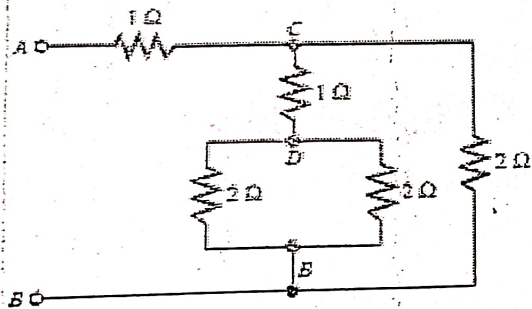


Figure 1

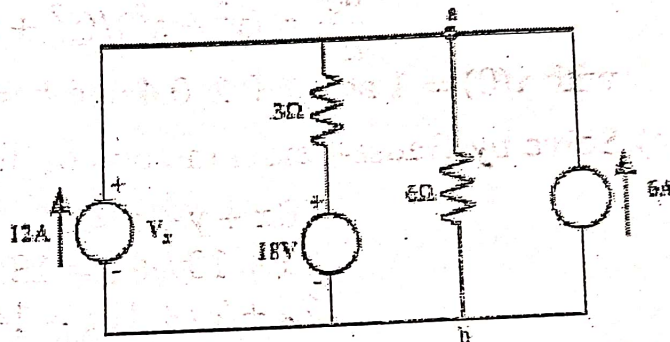


Figure 2

Q (3) For the circuit shown Figure 2 (a) find V_x using the mesh current method. (10M)

Q (4) Derive the expression for star-delta transformation (10M)

Q (5) From first principles derive the e.m.f equation for transformer (10M)

Q (6) Explain the action of a $p-n$ junction with bias. Consider both the forward bias and the reverse bias, and use sketches wherever possible. (10M)

Q (7) Show the two applications of Zener diode and explain the operation of under forward and reversed biased condition (10M)

Total No. of Pages: 01
Third Semester

End Semester Examination

Roll No.....
B.Tech. (Evening Program)

(JANUARY- 2021)

CECE 303

Hydraulic Engineering-I

Max. Marks: 70

Time: 3.0 Hours

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

1. (a) What is real and ideal fluids? Explain the various types of fluids with neat diagram.
(b) Describe the different types of the pressure gauges and differentiate among absolute pressure and atmospheric pressure with neat sketches.
2. (a) What do you understand by velocity potential and stream functions ?
(b) A rectangular plate 3m long and 1m wide is immersed vertically in water in such a way that parallel to the water surface and is 1m below it. Find total pressure and position of centre of pressure.
3. (a) What is a mouthpiece? Describe the various hydraulic coefficients with neat sketches.
(b) What is Bernoulli's Equation? Derive the Bernoulli's Equation.
4. (a) Discuss the different types of minor losses in pipe flow with neat diagrams.
(b) Three pipes of lengths 800m, 500m and 400m and of diameters 500mm, 400mm and 300mm are connected in series. These pipes are to be replaced by a single pipe of length 1700m. Find the diameter of the single pipe.
5. A Pelton wheel turbine is to be designed for the following specifications :
Shaft Power = 11772 KW; Head = 30 m; Speed = 750 rpm; Overall efficiency = 86%; Jet diameter should not exceed one sixth of the wheel diameter. Determine
(i) The wheel diameter (ii) Number of jets required (iii) Diameter of jets
(iv) Number of buckets.
6. Define the specific speed of the turbine and derive the expression for the same.
7. Write short notes on any **TWO**
 - (a) Properties of fluids
 - (b) Newton's law of Viscosity
 - (c) Classification of turbines
 - (d) Laminar and turbulent flow

Total No. of Pages 02

Roll No. _____

**SEVENTH SEMESTER
END SEMESTER EXAMINATION**

**B.TECH. [Evening] [CIVIL ENGG.]
(January, 2021)**

CECE701 Design of Steel Structures

Time: 3:00 Hours

Max. Marks: 70

Note: Answer ALL questions by selecting any two parts from each question.
All questions carry equal marks.
Use of **IS800:2007** and **Steel Table** are permitted.
Use Fe410 steel of grade and f_y is equal to 250 MPa until and unless given in the problem.
Assume suitable missing data, if any.

- Q.1 (a) What is Structural steel? Write the different types of steel structures.
(b) Describe the Load Transfer Mechanism in the bolted connection with the help of neat diagrams.
(c) Write the types of welding used in the welded connection. Also list the advantages of welded connection.
- Q.2 (a) Two plates of thickness 16 mm each are to be connected using M20 HSFG bolts of grade of 8.8 in Butt joint with 10 mm cover plates. Determine the bolt value. Take slip factor = 0.48.
(b) A double cover butt joint, with bolts arranged in diamond pattern, is to be provided for connecting two tie bars each 240 mm wide and 22 mm thick. Design the joint and determine the strength and efficiency of joint.
(c) A double cover butt joint is to be provided for connecting two 12 mm and 20 mm thick plates of suitable width carrying tensile load of 800 kN. Design the joint using 20 mm diameter black bolts grade 4.6 for connection and also determine the efficiency of the joint.

Contd.....2

- Q.3 (a) A diagonal tension member in the end panel of a truss bridge carries a tensile service load of 700 kN. The member consists of two angle section 110 x 110 x 10 and is connected to a 15 mm gusset plate using site fillet welds with angles placed on opposite sides of gusset. Design a welded connection.
- (b) Design a connection to joint two plates of size 300 x 12 mm to mobilize full plate tensile strength using shop welds, if (i) lap joint is used (ii) a double cover butt joint is used.
- (c) A tie member of a truss consisting of an angle section ISA 65 x 65 x 6 is welded to an 8 mm gusset plate. Design a weld to transmit a load equal to the full strength of the member. Assume shop welding.
- Q.4 (a) A tension member consists of two ISA 80x80x6 angles bolted to 12 mm thick gusset. Determine the design tensile strength of the member, section efficiency and the number of bolts required to develop full capacity of the member when the angles are connected to opposite sides of the gusset. Members use single line of 20 mm bolts of grade 4.6 and are tack bolted.
- (b) Design a 3 m long single angle tension member to support dead tensile working load of 120 kN and a live tensile load of 166 kN. The member is to be connected to the gusset plate through one leg with 20 mm diameter bolts of grade 4.6.
- (c) Determine the tensile strength of a roof truss diagonal ISA 100x75x6 mm longer side of angle connected to the 12 mm thick gusset plate by 4 mm fillet welds.
- Q.5 (a) Determine the compressive resistance of a 150 x 150 x 16 angle assuming that the angle is loaded through only one leg, when (i) it is connected by two bolts at the ends, (ii) it is connected by one bolt at each end and (iii) it is welded at each end.
- (b) Design a double angle discontinuous strut to carry a factored load of 175 kN. The length of strut is 3 m between intersections. The two angles are placed back to back on opposite sides of the gusset plate and are tack bolted.
- (c) Design a simply supported beam of span 4 m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The uniformly distributed load is made up of 20 kN/m imposed load and 20 kN/m dead load (section is stiff against bearing).

-125- 125-

Total No. of Pages: 01
Seventh Semester
END SEMESTER EXAMINATION

Roll No.
B.Tech. (Evening Program)
(JANURARY- 2021)

Paper code: CECE 702

Water Resources Engineering-II

Time: 3.0 Hours

Max. Marks: 70

Note: Answer any FIVE questions.

Assume suitable missing data, if any.

- 1 a. Enumerate the different forces acting on a gravity Dam. How will you determine the self weight of the gravity Dam. 4
b. What are the factors on which selection of the site for a Dam depends? 10
- 2 A gravity dam is 10 m high. It has top width of 1 m and base width 9 m. The front face is vertical. Assume that the weight of concrete is 2400 Kg/m^3 and water is stored up to the top of the Dam (Density of water is 1000 Kg/m^3). Find the following 14
I. Test the stability of above gravity Dam in all aspects.
II. Determine the compressive stresses at the bottom of the dam.
- 3 a. What is a spillway? What are its functions? Enumerate various types of spillways. 4
b. Compute the discharge over an Ogee spillway with coefficient of the discharge $C_d = 2.5$ at a head of 4 m. The effective length of spillway is 100 m. Neglect the velocity approach. 10
- OR 14
Describe the various methods of energy dissipation below the spillways with detailed explanation.
- 4 a. Derive an expression for discharge from a well fully penetrating a confined aquifer. 10
b. Define the Aquifer, aquiclude, Unconfined Aquifer and Confined Aquifer. 4
- 5 A Confined tube well has a diameter 20 cm. The thickness of aquifer is 30 m and its permeability is 38 m/day. Find the discharge of the confined tube well under a drawdown of 4 m at the well face. 14
- 6 Explain the various components, along with their functions, of a diversion headwork. 14
OR
Describe different types of weirs. Distinguish clearly between weir and barrage.
- 7 What is the necessity of cross drainage structures? Describe the different types of cross drainage structures with neat sketches and suitable examples. 14

CEME-101, Applied Mathematics

Time: 3.0 Hours

Max. Marks: 70

Note: Attempt any five questions and all questions carry equal marks. Assume suitable missing data, if any. Simple calculators are allowed.

1. (a) Show that

$$\sin^{-1}x = x + \frac{1^2}{3!}x^3 + \frac{1^23^3}{5!}x^5 + \frac{1^23^25^2}{7!}x^7 + \dots$$

Hence find the value of π .

- (b) Find the radius of curvature at the point
- (x, y)
- of the curve
-
- $$x^2 + y^2 = a^2.$$

2. (a) Find the
- A^{-1}
- by Gauss-Jordan method

$$A = \begin{bmatrix} 1 & 1 & -3 \\ 1 & 4 & 3 \\ -3 & 3 & 2 \end{bmatrix}$$

- (b) Test for consistency the following system and find solution, if it exists:

$$2x - 2y + 5z = 5$$

$$x + 3y - 3z = 1$$

$$3x + 8y - 7z = 4.$$

3. (a) Solve the simultaneous differential equations

$$\frac{dx}{dt} + 3x - y = 0, \quad \frac{dy}{dt} - x + 2y = 0$$

- (b) Solve

$$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 2y = e^{2x}$$

4. (a) Evaluate by change the order of integration in the integral

$$\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{2x dy dx}{\sqrt{x^2 + y^2}}.$$

- (b) Evaluate

$$\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{4}{\sqrt{1-x^2-y^2-z^2}} dz dy dx.$$

5. (a) Test for convergence or divergence the series:

$$\sum_{n=1}^{\infty} \frac{1}{n^p}, \quad p \geq 0.$$

- (b) If $x = e^{i\theta}$, show that

$$x^m + \frac{1}{x^m} = 2 \cos m\theta$$

6. (a) Find a cosines series of $\sin x$ in the interval $(0, \pi)$.

- (b) Find the Fourier series for the function $f(x)$ in the interval $(-\pi, \pi)$

where

$$f(x) = \begin{cases} \pi + x^2, & -\pi < x < 0, \\ \pi - x^2, & 0 < x < \pi. \end{cases}$$

7. (a) Find the eigenvalues and eigenvectors of $Ax = \lambda x$, where

$$A = \begin{bmatrix} -1 & 2 & -1 \\ 2 & 1 & -3 \\ -1 & -3 & 0 \end{bmatrix}.$$

- (b) Verify *Euler's Theorem* for u , where

$$u = \frac{(x^{1/4} + y^{1/4})}{(x^{1/5} + y^{1/5})}.$$

FIRST SEMESTER

B.Tech (CEME)

END SEMESTER EXAMINATION

(JAN-2021)

CEME-102 ELECTRICAL TECHNOLOGY

Time: 3Hours

Max. Marks : 70

Note : Attempt any **Five** Questions
Assume suitable missing, if any.

- 1[a] State and prove maximum power transfer theorem. 7
- [b] Find Thevenin's equivalent circuit across the terminal ab of the network shown in fig1. 7

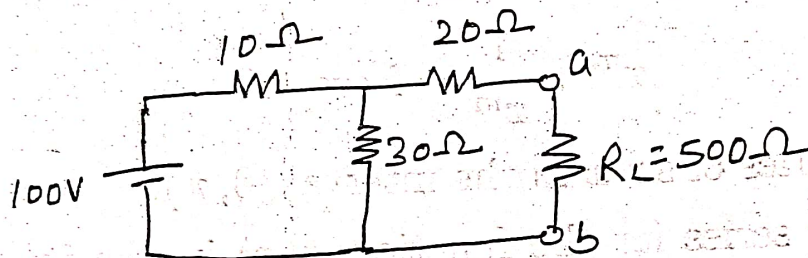


Fig-1

- 2[a] Find current I in the circuit shown in fig 2 using superposition theorem 7

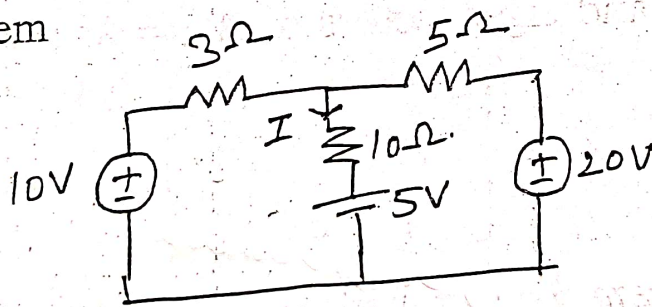


Fig-2

- [b] State and prove Norton's Theorem 7
- [b] Explain resonance in parallel RLC circuit. Derive the expression for resonance frequency. 7
- 3[a] Find current in all branches of the network shown in fig 3(a). using mesh analysis. 7

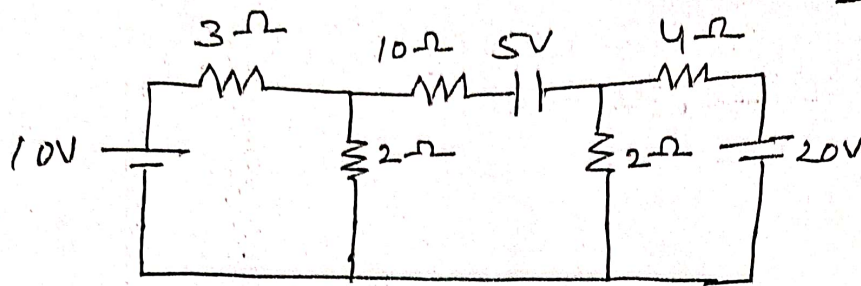


Fig-3(a)

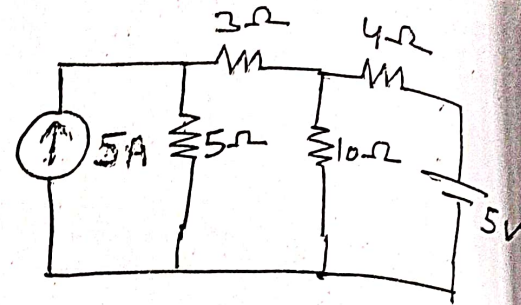
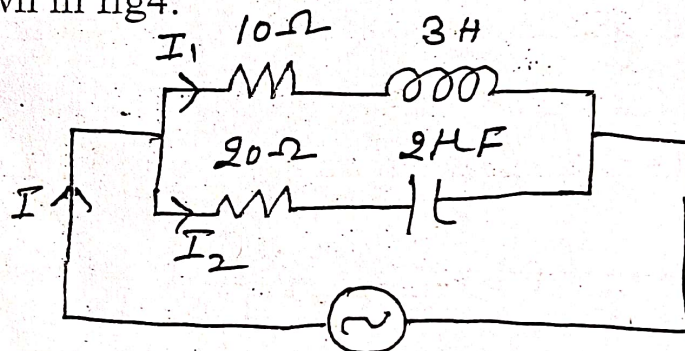


Fig-3(b)

[b] Find nodal voltage for the given network shown in fig. 3(b). 7

4[a] Explain resonance in series RLC circuit. Derive the expression for resonance frequency.

[b] Find Current I , I_1 , I_2 , total power consumes and power factor of the network shown in fig4. 7



230V, 50Hz Fig-4

5[a] Derive relationship between line and phase current for three phase four wire system. 7

[b] Explain measurement of three phase power using two wattmeter method and prove that $W_1 + W_2 = \sqrt{3} V_L I_L \cos \theta$. 7

6[a] Derive the emf equation of the single phase transformer 7

[b] Explain different characteristics of the dc shunt motor. 7

7 Write short notes on any two of the following

7x2=14

[a] Moving coil instruments

[b] Dynamometer type wattmeter

[c] KCL and KVL

Total No. of Pages: 02

Roll No:

IIIrd SEMESTER

B. Tech.(Evening)

END TERM EXAMINATION

January 2021

CEME - 301 Applied Mathematics-II

Time: 3 Hours

Max. Marks: 70

Note: Attempt all the questions by selecting any two parts from each question.

- (1) (a) Use Divergence theorem to evaluate $\iint_S \vec{F} \cdot \hat{n} dS$, where $\vec{F} = 4x^3\vec{i} - x^2y\vec{j} + x^2z\vec{k}$ and S is the surface bounding the region $x^2 + y^2 = a^2$, $z = 0$, and $z = b$.

- (b) Find the circulation of \vec{F} around the curve C , where

$$\vec{F} = e^x(\sin y\vec{i} + \cos y\vec{j})$$

and C is the rectangle whose vertices are $(0, 0)$, $(1, 0)$, $(1, \frac{\pi}{2})$, $(0, \frac{\pi}{2})$.

- (c) If

$$\vec{V} = \frac{xi + yj + zk}{\sqrt{x^2 + y^2 + z^2}},$$

show that

$$\nabla \cdot \vec{V} = \frac{2}{\sqrt{x^2 + y^2 + z^2}} \text{ and } \nabla \times \vec{V} = 0.$$

(14)

- (2) (a) Show that

$$\int_0^1 x^m (\log x)^n dx = \frac{(-1)^n (n!)}{(m+1)^{n+1}},$$

where n is a positive integer and $m > -1$.

- (b) Use the Stoke's theorem to evaluate

$$\int_C \vec{F} \cdot d\vec{r},$$

where the function $\vec{F} = x^2\vec{i} + xy\vec{j}$ integrated round the square whose sides are $x = 0$, $y = 0$, $x = a$ and $y = a$ in the plane $z = 0$.

Q.T.O

- (c) If ϑ is the acute angle between the surfaces $xy^2z = 3x+z^2$ and $3x^2 - y^2 + 2z = 1$ at the point $(1, -2, 1)$, find the value of ϑ . (14)
- (3) (a) Using *Laplace transforms*, find the solution of the initial value problems

$$\frac{d^2y}{dx^2} + y = 3 \cos 2x, \text{ at } y = \frac{dy}{dx} = 0, \text{ where } x = 0.$$

- (b) Find the *inverse Laplace transforms* of

$$\frac{s-1}{s^2-6s+25}.$$

- (c) Find the *Laplace transforms* of

$$\frac{1}{t} (\cos at - \cos bt). \quad (14)$$

- (4) (a) Prove that

$$\frac{d}{dx} (x^{-n} J_n) = -x^{-n} J_{n+1}.$$

- (b) Show that

$$\int_0^1 P_m(x) P_n(x) dx = 0, \text{ when } m \neq n.$$

- (c) Find the relation between *Beta* and *Gamma* functions. (14)

- (5) (a) Evaluate the integral

$$\int_0^{1+i} (x - y + ix^2) dz$$

along the straight line from $z = 0$ to $z = 1 + i$.

- (b) Determine the analytic-function, whose real part is $x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$.

- (c) Find the inverse Laplace Transform by convolution theorem

$$L^{-1} \left[\frac{1}{s(s^2 + a^2)} \right]$$

Total No. of Pages 2

-132-

Roll No.

THIRD SEMESTER

B.Tech. [Evening](Old Scheme)

END SEMESTER EXAMINATION

(January - 2021)

CEME-303 ELECTRONICS

Time: 3:00 Hours

Max. Marks : 70

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

- 1[a] Explain diode current equation with the help of V-I characteristics of PN-junction diode. 7
- 1[b] The collector and base current of an NPN transistor are $I_C = 5\text{mA}$, $I_B = 50\mu\text{A}$ and $I_{CBO} = 1\mu\text{A}$. Determine (i) α , β , I_{CEO} and I_E . (ii) new level of I_B required to produce $I_C = 2.5\text{mA}$. 7
- 2[a] Draw common emitter configuration, then derive output current equations including leakage current. Also provide relation in between α , β and γ . 7
- 2[b] Why biasing is required in transistor. Explain voltage divider biasing in detail with suitable diagrams and expressions. 7
- 3[a] Draw the circuit of full wave bridge rectifier and explain its working. 7
- 3[b] Compare conventional diode and zener diode. Discuss breakdown phenomena in diodes using their V-I characteristics. 7
- 4[a] Draw drain and transfer characteristics of n-channel JFET and explain its working with equations and suitable diagrams. 7
- 4[b] Compare MOSFET and JFET. Explain n-channel depletion MOSFET operation with transfer characteristics. 7
- 5[a] Elaborate the concept of feedback with expressions for effective gain with positive and negative feedback. 7
- 5[b] Explain the concept of Barkhausen criterion for oscillations and working of RC phase shift oscillator. 7
- 6[a] Draw block diagram and equivalent circuit of an Op-amp and discuss various features of Op-amp. Also draw and explain open loop configurations of an Op-amp. 7

6[b] Explain Op-amp as an integrator, differentiator and summer with complete derivations and suitable diagrams. 7

7[a] Convert the followings:

(i) $(2DE.CA6)_{16} = (\dots\dots\dots)_2$

(ii) $(25.5)_{10} = (\dots\dots\dots)_2$ 2+2+

(iii) $(247)_{10} = (\dots\dots\dots)_8 = (\dots\dots\dots)_2$

7[b] Consider the following Boolean function and minimize it using Karnaugh map method with sum of product simplification and implement using logic gates. 7
 $F(A,B,C,D) = \sum (0,1,2,3,7,8,9,10,11,12,13).$

-END-

— 134 —

Total no. of pages : 2

Roll No. _____

V SEMESTER

B.Tech (Mech. Engg.)

END SEMESTER EXAMINATION

Jan 2021

CEME-503

DYNAMICS OF MACHINES

Time : Three hours

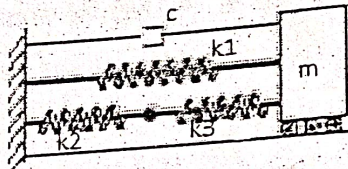
Max. Marks: 70

Note: Attempt any FIVE questions. All question carries equal marks.

Assume missing data , if any.

- 1.a With the help of neat sketch, describe the functioning of Pickering governor. 4
- 1.b A punching machine is coupled to a 2-stroke internal combustion engine which produces a torque of $(1500 + 200 \sin 3\theta)$ Nm, where θ is the crank angle from IDC. The mean engine speed is 500 rpm. The flywheel and the other rotating parts attached to the engine have a mass of 200 kg at a radius of gyration of 225mm. Determine the (i) power of the engine, (ii) total fluctuation of speed of the flywheel when (a) resisting torque is constant and (b) resisting torque is $(1500 + 200 \sin \theta)$. The cycle repeats after 120° . 10
- 2.a With the help of example, differentiate between flywheel and mechanical governor. 4
- 2.b Explain the effect of (i) hammer blow (ii) tractive effort and (iii) swaying couple and also derive the expressions for same in a two cylinder in line, crank 90° apart, uncoupled locomotive engine. 10
- 3.a Explain the importance and application of the inertia forces. 4
- 3.b Derive the expression for stiffness of the compression spring for a Hartnell governor. Also obtain its value with the following data:
 $w = 1.4$ kgf, $r_1 = 11.25$ cm, $r_2 = 7.5$ cm, $N_1 = 318$ rpm, $N_2 = 300$ rpm. The axis of rotation is 9cm from the fulcrum of the bell crank lever, the bigger (ball arm) and smaller arms (sleeve arm) of the lever are 11.25cm and 7.5cm respectively. 10
- 4.a. Describe the stabilization of bicycle. 7
- 4.b A steamer is propelled by a steam turbine. The moment of inertia of the rotor, shaft and propeller is 60 kg-m^2 . The turbine runs at 3000 rpm in clockwise direction looking from the front and the steamer takes circular path towards right. It completes one complete revolution in 12 seconds. Determine the magnitude and direction of the couple acting on the hull. 7
- 5.a Compare longitudinal, transverse and torsional mechanical vibrations with the help of the examples in nature. 7

- 5.b An aeroplane makes a complete half circle of 500m radius towards left when flying at 900 km/hour. The rotary engine and the propeller of the planes weigh 500 kg having a radius of gyration of 40 cm. The engine rotates at 9000 rpm counter clockwise viewing from the rear. Determine the gyroscopic couple on the aircraft and state its effect on it. What will be the effect of gyroscopic couple, if the aeroplane turns to its right instead to its left. 7
6. The firing order of a six cylinder, four stroke, in line internal combustion engine is 1-4-2-6-3-5. The piston stroke is 20cm and the length of each connecting rod is 36 cm. The pitch distance between central line of piston are 10 cm, 19 cm, 15 cm, 20 cm and 10 cm successively. The reciprocating mass per cylinder is 0.75 kg and the engine runs at 6000 rpm. Determine the primary and secondary unbalance forces and couples on this engine, taking reference plane as midway between cylinder 3 and 4. (Use graphical method) 14
- 7.a Calculate the natural frequency and damping ratio for the system given below given the values $m = 12 \text{ kg}$, $c = 100 \text{ kg/s}$, $k_1 = 4000 \text{ N/m}$, $k_2 = 200 \text{ N/m}$ and $k_3 = 1000 \text{ N/m}$. Assume that no friction acts on the rollers. Is the system overdamped, critically damped or underdamped? 7



- 7.b Four masses A, B, C and D are rotating on the shaft in the order and radius of rotation of are 18cm, 24cm, 12cm and 15cm respectively. The system is completely balanced. The masses of B, C and D are 30, 50 and 40 respectively. The planes containing masses B and C are 30cm apart. The angle between planes containing masses B and C is 90° . B and C make angle 120° and 210° respectively with D in the same sense. Determine i) The mass and angular position of A. ii) the position of planes A and D. 7
8. Attempt any two of the following
- Describe the function of flywheel in punching press. 7
 - Differentiate among under, over and critical damped vibration systems. 7
 - Discuss the effect of the whipping speed of the rotating shaft. 7
 - Describe the function of flywheel and mechanical governor. 7

Total no. Of pages : 1

SEVENTH SEMESTER

B.Tech. (Branch -Mechanical-)

Roll No.

END SEMESTER EXAMINATION JAN 2021 (Old scheme)

CEME 702 HEAT TRANSFER

Time : 3 hr

Max Marks: 70

Answer any FIVE questions. Assume missing data suitably if any.

1.(a) Derive the three dimensional general heat conduction equation for plane wall.

(b) The thermal conductivity of a plane wall varies as

$$k = k_0 (1 + b T + c T^2)$$

If the wall thickness is L and surface temperatures are T_1 and T_2 respectively, derive the expression for heat flux through the wall. (7,7)

2(a) Derive the expression for heat flow rate for a three layered composite spherical wall and also develop the expression for overall heat transfer coefficient for the composite spherical walls.

(b) Saturated steam at 115°C flows inside a copper pipe ($k=450\text{ W/mK}$) having ID of 10 cm and OD of 12 cm. The heat transfer coefficient on the steam side is $12\text{ kW/m}^2/\text{K}$ and that on the outside surface of pipe is $18\text{ W/m}^2/\text{K}$. Determine the heat loss from the pipe if it is located at a space at 30°C . How this heat loss would be affected if the pipe is lagged with insulating material ($k=0.22\text{ W/mK}$) having thickness of 5 cm. (7,7)

3.(a) Derive the expression for temperature distribution and heat dissipation from a long fin.

(b) What is transient heat conduction? Explain the significance of Biot number and Fourier number. (7,7)

4.(a) What is radiation heat transfer? Derive the expression for rate of radiation heat transfer between two parallel black surfaces.

(b) Consider radiative heat transfer between two large parallel planes of surface emissivities of 0.8. How many radiation shields of emissivity of 0.05 are placed between the surfaces to reduce the radiation heat exchange by a factor of 75? - (7,7)

5(a) Explain the dimensional analysis applied to free convection heat transfer.

(b) Explain the principle of boiling heat transfer with neat sketch. (7,7)

6(a) Define effectiveness of heat exchanger and derive the expression for effectiveness of parallel flow heat exchanger.

(b) A counterflow heat exchanger is to be designed to cool 3600 kg/hr of oil ($C_p = 2\text{ kJ/kg/K}$) from 150°C to 80°C with 1800 kg/hr of water ($C_p = 4.18\text{ kJ/kg/K}$) available at 25°C . Determine the heat exchanger surface area. Take $U = 500\text{ W/m}^2/\text{K}$. (7,7)

7 Explain the following:

(a) Critical thickness of insulation for cylindrical and spherical surfaces

(b) Forced convection heat transfer (8,6)

Total No. of Pages: 02

B. Tech. (ME)

End Semester Examination

CEME-701 MACHINE DESIGN(Old Scheme)

Time: 3 hrs

-137-

Roll No.

Seventh Semester

(Jan-2021)

Max. Marks: 70

Note: Attempt any FIVE questions. Assume suitable missing data, if any. Use of design data hand book is permitted.

- 1) (a) Explain minor's rule with reference to fatigue. [4]
(b) A machine component is subjected to fluctuating stress that varies from 40 to 100 N/mm². The corrected endurance limit stress for the machine component is 270 N/mm². The ultimate tensile strength and yield strength of the material are 600 and 450 N/mm². Find the factor of safety using
(i) Gerber theory
(ii) Soderberg line
(iii) Goodman line [4+3+3]
- 2) Design a spigot-socket cotter joint for an axial load of 80kN in tension and compression. It is assumed that all parts are made of the same material with the permissible stress of 70MPa, 50MPa, and 90MPa in tension, shear and compression respectively. Also, sketch the joints. [14]
- 3) Design a triple riveted double strap butt joint with unequal covers for longitudinal joint, a boiler shell having a 1.5m internal diameter to withstand maximum pressure 1.8MPa. Assume that shell plate and rivets are made of steel having following allowable stresses, $\sigma_t = 90 \text{ N/mm}^2$, $\tau = 60 \text{ N/mm}^2$ and $\sigma_c = 140 \text{ N/mm}^2$. Also, sketch the joints. [14]
- 4) A solid shaft is subjected to a twisting moment of 800N-m, a bending moment of 200N-m. If the maximum allowable values of normal and shear stresses are 140N/mm² and 80N/mm² respectively, determine the diameter of the shaft. [14]

P.T.O

- (5) Design a helical spring used in an engine for the given data.
Length of spring when the valve is open = 40 mm
Length of spring when the valve is closed = 50 mm
Spring load when the valve is open = 400 N
Spring load when the valve is closed = 200 N
Maximum inside dia of spring = 28 mm
Maximum permissible shearing stress = 400 MPa
Modulus of rigidity = 80 GPa
- (6) It is required to design a pair of spur gears with 20° full-depth involute teeth based on the Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10 kW, 1440 rpm motor. The starting torque of the motor is 150% of rated torque. The speed reduction ratio is 4:1. The pinion as well as gear is made of plain carbon steel 40C8 (ultimate tensile stress = 600 MPa). The factor of safety can be taken as 1.5. Design the gears and specify their dimensions and suggest suitable surface hardness for the gears.
- (7) Design and draw a cast iron protected type flange coupling to connect two shafts of 36 mm diameter transmitting 15 kW at 720 rpm. The overload capacity is 1.25 times average torque. The bolts and keys are made of steel and the flange is made of FG200.

Total no. of pages : 2

1st SEMESTER

END SEMESTER EXAMINATION

CEEE - 101 Engineering Mathematics-I (old sch.)

Time : 3.0hrs

Roll No.

B.Tech(P/T) (Electrical)

Jan 2021

Max. Marks: 70

Note: Attempt all questions selecting **two parts** from each question. All are of equal marks. Assume missing data, if any.

- 1 (a) Discuss the convergence of the series for real x

$$\sum x^n$$

- (b) Discuss the convergence of the series whose n th term is;

$$u_n = \frac{(-1)^n}{n^3}$$

- (c) Find all roots of equation $x^3 - 1 = 0$ using De-Moivre's theorem.

- 2 (a) Determine the eigenvalues and eigenvector of the matrix

$$A = \begin{pmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 1 \end{pmatrix}$$

- (b) Test for the consistency, and if consistent then solve the system of equation

$$x + y + z = 6,$$

$$x + 2y + 3z = 14,$$

$$x + 4y + 9z = 36,$$

- (c) Find the rank of the matrix

$$A = \begin{pmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix}$$

- 3 (a) Solve the differential equation $(D^2 + 2pD + p^2)y = 0$

- (b) Solve the differential equation $(D^2 - 4)^2 y = e^{4x}$

- (c) Solve the differential equation $(D^3 + 3^2)y = \sin 2x$

- 4 (a) Expand $\cos x$ in powers of $(x - \frac{\pi}{2})$ using Taylor's Theorem.

- (b) A cup is formed by the revolution of the curve $x^3 = 64y$ about y -axis. If the depth of cup be 8 cm, how many cu. cm of water will it hold.

- (c) If $u = \tan^{-1} \frac{x^3 - y^3}{x - y}$ prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$.

- 5 (a) The part of the parabola $y^2 = 4ax$ cut off by the latus rectum revolves about the tangent at the vertex. Find volume of the solid thus generated.

- (b) Evaluate $\int_0^a \int_y^a \frac{x}{x^2 + y^2} dx dy$ by changing the order of integration.

- (c) Find Laplace transform of the function $f(t) = \sin^2(t)$