

Code No: 151AE

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, May/June - 2019

APPLIED PHYSICS
(Common to ECE, EIE)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

- 1.a) What is the concept of black body radiation? [2]
- b) What is the importance of Fermi level? [2]
- c) What is the basic principle of LED's? [2]
- d) Explain the dispersion losses in optical fiber? [2]
- e) What are the differences between polar and non-polar dielectrics? [2]
- f) Explain the wave-particle duality? [3]
- g) What is the Hall effect? [3]
- h) What is the recombination mechanism in semiconductors? [3]
- i) What is the laser? Explain its principle. [3]
- j) State Ampere's law in differential and integral forms? [3]

PART-B

(50 Marks)

- 2.a) What are essential physical assumptions needed to explain the characteristics of Photoelectric effect?
 - b) Derive time independent of Schrodinger's wave equation for a free particle.
 - c) Calculate the deBroglie wavelength of the neutron of energy 28.85 eV. [10]
- OR**
- 3.a) Briefly explain about the Compton effect.
 - b) State and explain the Heisenberg's uncertainty principle.
 - c) Find the lowest energy of an electron confined in a box of side 0.1 nm each. [10]
- 4.a) Distinguish between the intrinsic and extrinsic impurity semiconductors.
 - b) Derive an expression for the density of holes in intrinsic semiconductors.
 - c) Explain I-V characteristics of zener diode. [10]
- OR**
- 5.a) Explain the variations of Fermi level with temperature in the case of n-type semiconductors.
 - b) How the PN junction diode is formed? Explain the rectifying action of PN junction diode?
 - c) Write a detailed note on BJT. [10]

- 26 26 26 26 26 26 26
- 6.a) Explain the radiative and non radiative recombination mechanism in semiconductors?
b) Explain the construction and working principle of PIN photo diode detector.
c) Discuss about the semiconductor laser. [10]

OR

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- 7.a) What are the advantages and disadvantages of LED in electronic display?
b) Write a detailed note on avalanche photo diode detector.
c) What is the basic principle of the solar cell? Explain the I-V characteristics of solar cell. [10]

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- 8.a) Distinguish between the spontaneous and stimulated emission processes of light.
b) What do you understand by population inversion? How is it achieved?
c) With necessary energy level diagram explain the working of a Helium-Neon laser. [10]

OR

- 9.a) Explain briefly basic principle of optical fiber.
b) Derive an expression for the numerical aperture and acceptance angle.
c) Describe graded index fiber and explain the transmission of signal through it. [10]

- 26 26 26 26 26 26 26
- 10.a) Write the Maxwell equations integral and differential forms. Explain the physical significance of each.
b) The dielectric constant of He gas at NTD is 10000684. Calculate the electronic polarizability of He atoms if the gas contains 2.7×10^{25} atoms per m^3 ?
c) What is Bohr magneton? How it is related to magnetic moment of electron. [10]

OR

- 26 26 26 26 26 26 26
- 11.a) What is electric current? Derive an expression for the continuity equation.
b) Derive an expression for the Claussius-Mossotti relation equation.
c) Explain how the ferrites superior to ferromagnetic materials. [10]

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Code No: 151AG

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, May/June - 2019

BASIC ELECTRICAL ENGINEERING

(Common to EEE, CSE, IT)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

- 1.a) State Thevenin's theorem. [2]
- b) What is meant by apparent power? [2]
- c) Why the copper losses are more in a transformer? [2]
- d) What is necessity of rotating magnetic field in the induction motor? [2]
- e) What is the difference between fuse unit and switch fuse unit? [2]
- f) What is meant by capacitor charging current, obtain its expression in terms of its time constant in case of R-C circuit? [3]
- g) An alternating voltage $e_1 = 300 \sin\left(\omega t + \frac{\pi}{3}\right)$, what is its instantaneous voltage at $t = 5$ ms and 10 ms for 50 Hz frequency? [3]
- h) What is the difference between ideal transformer and practical transformer? [3]
- i) What are the advantages of armature winding placing in its stator? [3]
- j) What are the characteristics of batteries for longer life? [3]

PART-B

(50 Marks)

- 2.a) State Kirchhoff Current Law and Voltage law, determine the values for I_X and V_Y in the following given circuit shown in figure 1.

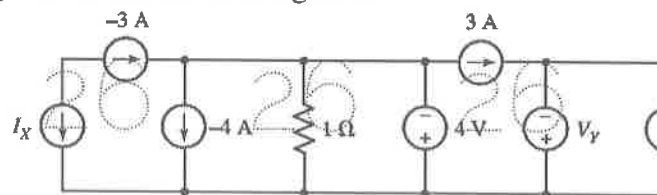


Figure: 1

- b) In the following given circuit shown in figure 2, calculate i) v_1, v_2 and v_3 ii) power delivered to R_1, R_2 and R_3 . [5+5]

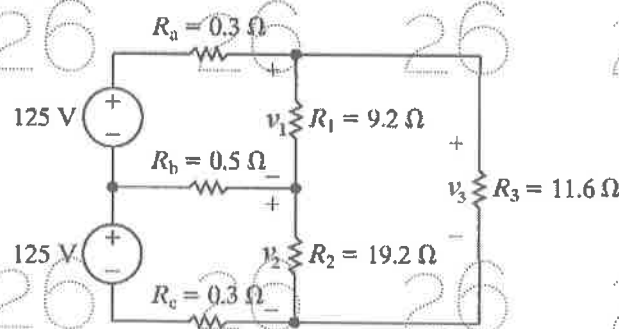


Figure: 2

OR

- 3.a) Find the Norton equivalent circuit of the following given circuit shown in figure 3 with respect to the terminals 'a-b'?

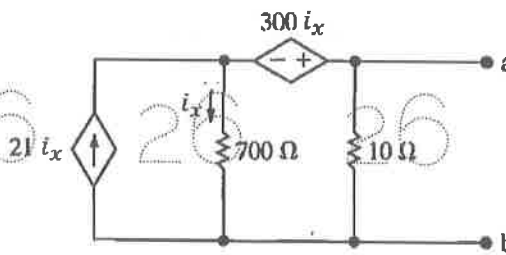


Figure: 3

- b) State and explain superposition theorem. [5+5]
- 4.a) Describe phasor representation of RL series circuit? If admittance of a series circuit is $(0.010 + j0.004) \text{ S}$. Determine the values of the circuit components for the frequency value of 50 Hz?
- b) Balanced Y-connected load of 10 kW at 0.8 power factor lagging supplied by a 50-Hz, 300-V, three-phase system. Find the line current delivered by the source. Draw the phasor diagram. [5+5]
- OR**
- 5.a) Explain how the sinusoidal waveform is represented as phasor quantity with example.
- b) A coil is connected in series with a capacitor of $20 \mu\text{F}$ to a 200 V variable frequency supply. The current is a maximum at 50 A, when the frequency is set to 50 Hz. Determine the resistance and inductance of the coil. [5+5]
- 6.a) Draw and explain the phasor diagram of single phase transformer on lagging load.
- b) A 50 kVA, 1000/10000 V, 50Hz single phase transformer has iron loss of 1200W. The copper loss with 5 A in the high voltage winding is 500 W. Calculate the efficiency at i) 25 %, ii) 50 % iii) 100 % of normal load at power factor of 0.8. [5+5]
- OR**
- 7.a) Describe the principle of operation of auto transformer, what is the saving of copper in this transformer when compared with two winding transformer?
- b) Discuss the various three phase transformer groups and their significance? [5+5]
- 8.a) Describe the constructional details of three phase slip ring induction motor.
- b) Describe the torque speed characteristics of separately excited dc motor. [5+5]
- OR**
- 9.a) What are the various losses occurs in the three phase induction motor in their operation?
- b) Describe briefly construction details of any three phase synchronous generator? [5+5]
- 10.a) Describe the operation of ELCB with its schematic diagram.
- b) What are the drawbacks of low power factor, describe how it is improved? [5+5]
- OR**
- 11.a) What is the difference between MCB and MCCB, describe their schematic diagrams?
- b) Calculate total energy consumed per day by the use of following loads:
- i) 5 number of 40 W lights operated 5 hours per day
 - ii) 1 h.p. motor is operated 2 hours per day
 - iii) 1 k.W heater is operated 1 hour per day
 - iv) 1 computer is used for 6 hours per day with printer about 30 minutes.
- [5+5]

Code No: 131AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, May/June - 2019

ENGINEERING CHEMISTRY

(Common to EEE, ECE, CSE, EIE, IT)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

- 1.a) What is break point chlorination? Give its advantages. [2]
- b) What is meant by reverse osmosis process? Write the advantages of this process. [3]
- c) Give the chemical reactions involved in the functioning of Hydrogen-Oxygen fuel cell. [2]
- d) Give the construction and cell reactions of standard hydrogen electrode. [3]
- e) Give the synthesis and applications of PVC. [2]
- f) What are bio-degradable polymers? Give two examples. [3]
- g) What is knocking? Mention an anti knocking agent. [2]
- h) Write the composition characteristics and applications of compressed natural gas. [3]
- i) What are the main components of water proof cement and high alumina cement? [2]
- j) How the composite materials have been classified? Give suitable examples. [3]

PART-B

(50 Marks)

- 2.a) Explain the principle, process, advantages and limitations of ion exchange method of softening of water.
- b) A sample of hard water contains the following dissolved salts per liter.
 $\text{NaCl} = 58.5 \text{ mg/L}$, $\text{Ca}(\text{HCO}_3)_2 = 16.4 \text{ mg/L}$, $\text{Mg}(\text{HCO}_3)_2 = 14.6 \text{ mg/L}$,
 $\text{CaCl}_2 = 111 \text{ mg/L}$, $\text{MgSO}_4 = 12 \text{ mg/L}$ and $\text{CaSO}_4 = 13.6 \text{ mg/L}$. Calculate temporary, permanent and total hardness of water in ppm and degree French. [5+5]

OR

- 3.a) What is Caustic embrittlement? What are the causes and preventive methods of it?
- b) What are the specifications of potable water? Write the steps involved in the treatment of potable water. [5+5]
- 4.a) Explain how the Glass electrode is used to determine the pH of a given solution. What are the limitations of glass electrode?
- b) What is secondary battery? Explain the discharging and recharging process of lead- acid battery. [5+5]

OR

- 5.a) What is concentration cell? Explain its functioning with suitable example.
- b) What is an electrochemical cell? Explain the working principle of Zn-Cu electrochemical cell. [5+5]

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- 6.a) Explain the mechanism involved in the conduction of trans poly acetylene. Give the applications of conducting polymers.
b) Why natural rubber is vulcanized? What are the advantages and applications of vulcanized rubber? [5+5]

OR

- 26 26 26 26 26 26 26 2
- 7.a) Write the preparation, properties and applications of Bakelite.
b) Explain about fiber reinforced plastics and their applications. [5+5]

- 8.a) Explain the ultimate analysis of coal? Write its significance.
b) Explain how gasoline is synthesized by Fischer-Tropsch's process. [5+5]

OR

- 26 26 26 26 26 26 26 2
- 9.a) What is cracking? Explain fluid bed catalytic cracking.
b) Write a short note each on Octane number and Cetane number. [5+5]

- 10.a) What is the composition of Portland cement? Write the steps involved in setting and hardening of Portland cement.
b) What are the characteristics of a good lubricant? Give the mechanism of thin film lubrication. [5+5]

OR

- 26 26 26 26 26 26 26 2
- 11.a) What are flash point and fire point of lubricant? Explain their significance.
b) Define refractory. Explain about refractoriness, porosity and chemical inertness of refractory. [5+5]

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Code No: 131AC

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, May/June - 2019

ENGINEERING PHYSICS

(Common to CE, ME, MCT, MMT, AE, PTM, CEE, MSNT)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

- 1.a) Describe the interference in thin films. [2]
- b) What is a plane diffraction grating? Explain. [3]
- c) State and explain Malus's law. [2]
- d) How population inversion is achieved in a laser? [3]
- e) Distinguish between the single mode and multimode optical fiber. [2]
- f) List and explain any three applications of optical fibers. [3]
- g) Find the number of atoms per unit cell for BCC and FCC structures in a crystal. [2]
- h) Define lattice points, Bravais lattice and primitive cell. [3]
- i) What are Laue spots? Explain. [2]
- j) How are vacancies created in a lattice? [3]

PART-B

(50 Marks)

- 2.a) How the wavelength of sodium light determined by Newton's rings method? Derive the formula used.
- b) Why the Newton's rings are circular? Explain.
- c) Calculate the minimum thickness of a soap bubble film that results in constructive interference in the reflected light if the film is illuminated with light whose wavelength in free-space is 600 nm. The index of refraction of the soap film is 1.33. [5+2+3]

OR

- 3.a) Give an account of the diffraction effects produced by a slit.
 - b) Explain what happens when the slit width is gradually increased and also when the screen is gradually moved away from the slit.
 - c) Light of wavelength 580 nm is incident on a slit having a width of 0.3 mm. The viewing screen is 2 m from the slit. Find the positions of first dark fringes and the width of the central bright fringe. [4+3+3]
- 4.a) What is plane polarized light? Explain.
 - b) Describe the construction and working of Nicol prism.
 - c) Two faces of a quartz plate are parallel to the optical axis of the crystal. What is the possible thinnest plate that would serve to put the ordinary and extraordinary rays of wavelength 589 nm a half-wave apart on their exit? The indices of refraction of quartz for ordinary and extraordinary rays are 1.544 and 1.553 respectively. [2+5+3]

OR

- 5.a) Describe the construction and working of a He-Ne laser.
b) Describe any three applications of lasers.

[6+4]

- 6.a) Describe the classification of optical fibers based on refractive index profile and propagation modes.
b) Define acceptance angle and numerical aperture.
c) A step index fiber has a numerical aperture of 0.26, a core refractive index of 1.5 and a core diameter of 100 μm . Find the refractive index of cladding.

[4+3+3]

OR

- 7.a) Discuss various attenuations taking place in an optical fiber.
b) An optical fiber is 2 m long and has a diameter of 20 μm . If a ray of light is incident on one end of the fiber at an angle of 40° , how many reflections does it undergo before emerging from the other end? Refractive index of fiber is 1.3.

[5+5]

- 8.a) What is coordination number?
b) Calculate the coordination number for simple cubic and body centered cubic lattices.
c) In a tetragonal lattice $a = b = 2.5 \text{ \AA}$, $c = 1.8 \text{ \AA}$. Deduce lattice spacing between (1, 1, 1) planes.

[2+5+3]

OR

- 9.a) What are Miller indices?
b) Explain with proper example how to determine Miller indices.
c) Deduce the relation between inter planar distance and Miller indices of the planes for a cubic system.

[2+4+4]

- 10.a) Give the theory of Bragg's X-ray diffraction and derive Bragg's law.
b) Discuss about stacking faults, twin, tilt and grain boundaries.

[5+5]

OR

- 11.a) What are crystal defects?
b) Mention the different kinds of crystal imperfections.
c) Distinguish between Schottky and Frenkel defects in ionic crystals.

[3+3+4]

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R15

Code No: 121AE

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May/June - 2019

ENGINEERING CHEMISTRY

(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, AE, MIE, PTM, CEE)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A**(25 Marks)**

- 1.a) What is the difference between chemical and electrochemical corrosion? [2]
- b) Write anode and cathode reactions of Ni-Cd cell. [3]
- c) What is a plastic? Give two examples. [2]
- d) Give the applications of refractories. [3]
- e) What is hardness of water? Give its units. [2]
- f) What is Caustic embrittlement? What are its effects? [3]
- g) What is CNG? Give its composition and uses. [2]
- h) What are the advantages and disadvantages of solid fuels? [3]
- i) Define Phase and degree of freedom of a system. [2]
- j) Calculate the number of components in the following reaction [3]
$$\text{NH}_4\text{Cl}_{(s)} \rightleftharpoons \text{NH}_{3(g)} + \text{HCl}_{(g)}$$

PART-B**(50 Marks)**

- 2.a) Explain the construction and working principle of Quinhydrone electrode. [5+5]
 - b) Explain the functioning of an electrochemical cell with example. [5+5]
- OR**
- 3.a) Describe electroless plating of Nickel. [5+5]
 - b) What is Cathodic protection? Explain sacrificial anode method. [5+5]
- 4.a) Give the differences between thermoplastic and thermosetting resins with examples. [5+5]
 - b) Write a note on conducting polymers. [5+5]
- OR**
- 5.a) What do you mean by setting and hardening of cement? Discuss the various steps involved with the help of chemical equations. [5+5]
 - b) Explain about cloud point, pour point and flash point of a lubricant. [5+5]
- 6.a) Explain Zeolite process of softening water. [5+5]
 - b) What is reverse osmosis? Explain. Give the advantages of reverse osmosis. [5+5]
- OR**
- 7.a) Write a note on Boiler corrosion. [5+5]
 - b) Explain EDTA method of estimation of temporary and permanent hardness of water. [5+5]

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- 8.a) Give the criteria for selecting good fuel.
b) Explain ultimate analysis of coal and give its significance.

[5+5]

OR

- 9.a) Explain the synthesis of petrol by Fischer Tropsch's process.
b) Explain the fixed bed catalytic cracking process with diagram.

[5+5]

- 10.a) Explain phase diagram of water system.
b) Derive Langmuir adsorption isotherm.

[5+5]

OR

11. Define the following terms:

a) Annealing b) Hardening c) Normalization d) Chemisorption e) Isotherm [10]

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Code No: 111AE

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May/June - 2019

ENGINEERING CHEMISTRY

(Common to CE, EEE, ME, ECE, CSE, IT, AE, MIE, PTM, AGE)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

- 1.a) What is the difference between chemical and electrochemical corrosion? [2]
- b) Write anode and cathode reactions of Ni-Cd cell. [3]
- c) What is a plastic? Give two examples. [2]
- d) Give the applications of refractories. [3]
- e) What is hardness of water? Give its units. [2]
- f) What is Caustic embrittlement? What are its effects? [3]
- g) What is CNG? Give its composition and uses. [2]
- h) What are the advantages and disadvantages of solid fuels? [3]
- i) Define Phase and degree of freedom of a system. [2]
- j) Calculate the number of components in the following reaction [3]
$$\text{NH}_4\text{Cl}_{(s)} \rightleftharpoons \text{NH}_{3(g)} + \text{HCl}_{(g)}$$

PART-B

(50 Marks)

- 2.a) Explain the construction and working principle of Quinhydrone electrode.
 - b) Explain the functioning of an electrochemical cell with example. [5+5]
- OR**
- 3.a) Describe electroless plating of Nickel.
 - b) What is Cathodic protection? Explain sacrificial anode method. [5+5]
- 4.a) Give the differences between thermoplastic and thermosetting resins with examples.
 - b) Write a note on conducting polymers. [5+5]
- OR**
- 5.a) What do you mean by setting and hardening of cement? Discuss the various steps involved with the help of chemical equations.
 - b) Explain about cloud point, pour point and flash point of a lubricant. [5+5]
- 6.a) Explain Zeolite process of softening water.
 - b) What is reverse osmosis? Explain. Give the advantages of reverse osmosis. [5+5]
- OR**
- 7.a) Write a note on Boiler corrosion.
 - b) Explain EDTA method of estimation of temporary and permanent hardness of water. [5+5]

- 26 26 26 26 26 26 26 2
- 8.a) Give the criteria for selecting good fuel.
b) Explain ultimate analysis of coal and give its significance. [5+5]

OR

- 9.a) Explain the synthesis of petrol by Fischer Tropsch's process.
b) Explain the fixed bed catalytic cracking process with diagram. [5+5]

- 10.a) Explain phase diagram of water system.
b) Derive Langmuir adsorption isotherm. [5+5]

OR

11. Define the following terms:
a) Annealing b) Hardening c) Normalization d) Chemisorption e) Isotherm [10]

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R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May/June – 2019

ENGINEERING MECHANICS

(Common to CE, ME, CHEM, AE)

Time: 3 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

- 1.a) Differentiate between moment of a force and a couple.
 - b) Draw FBD of a sphere placed on a 30° incline and supported by a vertical wall.
 - c) A force of 100N makes angles of 30° , 60° and 100° with x, y, z axes respectively. Find the components of the force along the x, y and z axes. [5+5+5]
- 2.a) State and prove Lami's theorem.
 - b) Determine the resultant of the parallel coplanar force system shown in figure 1. [7+8]

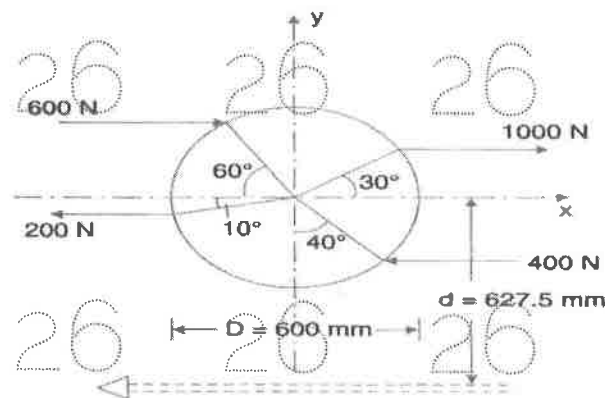


Figure: 1

- 3.a) Distinguish between centre of gravity and centroid.
- b) With respect to the coordinate axes x and y locate the centroid of the shaded area shown in figure 2. [7+8]

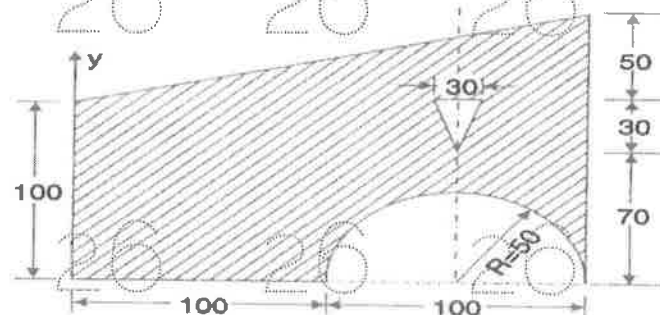


Figure: 2

4. Find the mass moment of inertia of a solid cone of height h and base radius R about:
 - a) Its axis of rotation
 - b) An axis through vertex normal to the axis of rotation. [7+8]

5. Determine the forces in all the members of the trusses shown in figure 3. Indicate the nature of forces using the convention tension as +ve and compression as -ve. [15]

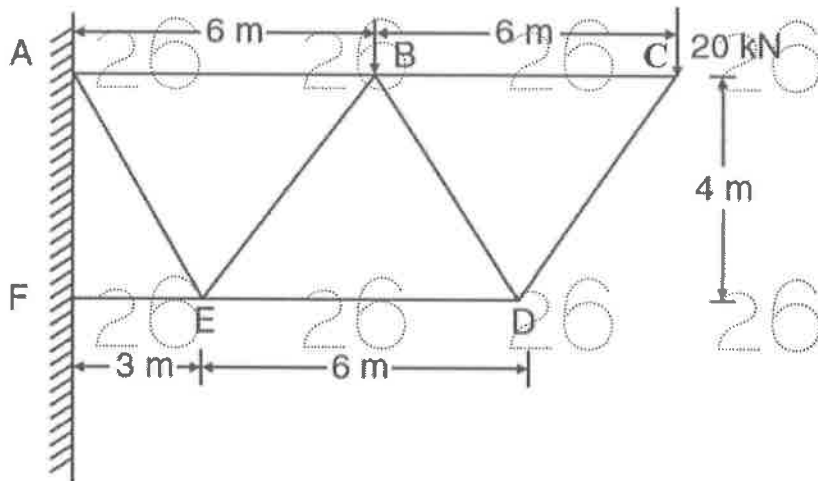


Figure: 3

- 6.a) Define the terms velocity of projection and angle of projection.
 b) Two cars are travelling towards each other on a single lane road at the velocities 12 m/sec and 9 m/sec respectively. When 100 m apart, both drivers realise the situation and apply their brakes. They succeed in stopping simultaneously and just short of colliding. Assume constant deceleration for each case determine:
 i) Time required for car to stop.
 ii) Deceleration of each car.
 iii) The distance travelled by each car while slowing down. [7+8]
- 7.a) Explain the term conservation of energy.
 b) A block weighing 2500N rests on a level horizontal plane for which coefficient of friction is 0.20. This block is pulled by a force of 1000N acting at an angle of 30° to the horizontal. Find the velocity of the block after it moves 30m starting from rest. If the force of 1000N is then removed, how much further will it move? Use work energy method. [7+8]
- 8.a) What is virtual work, principle of virtual work and its applications.
 b) A beam AB of span 8 m carries two point loads of 10 kN and 15 kN at 3 m and 5 m from the end A respectively. Determine the beam reactions by the principle of virtual work. [7+8]

R09

Code No: 51008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May/June - 2019

MATHEMATICAL METHODS

(Common to EEE, ECE, CSE, BME, IT)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Reduce the Matrix A to its normal form

Where $A = \begin{bmatrix} 2 & -1 & 3 & 4 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 5 \\ 2 & 5 & 11 & 6 \end{bmatrix}$ and hence find the rank.

- b) Show that the system of equations $x + y + z = 6$, $x + 2y + 3z = 14$, $x + 4y + 7z = 30$ is consistent and solve them. [7+8]

- 2.a) If $\lambda_1, \lambda_2, \lambda_3, \dots, \lambda_n$ are Eigen values of a square matrix A then prove that $K\lambda_1, K\lambda_2, K\lambda_3, \dots, K\lambda_n$ are Eigen values of KA.

- b) Find the Eigen values and the corresponding Eigen vectors of the matrix

$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. [6+9]

3. Identify the nature of the quadratic form $-3x^2 - 3y^2 - 3z^2 - 2xy - 2xz + 2yz$ and reduce it to canonical form by orthogonal reduction. [15]

- 4.a) Find a root of the equation $f(x) = x + \log x - 2$ using Newton Raphson method.

- b) Using Newton's forward interpolation formula find the value of $f(1.6)$ if

x	1	1.4	1.8	2.2
y	3.49	4.82	5.96	6.5

[7+8]

- 5.a) Fit a straight line to the following data:

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

- b) Evaluate $\int_0^{\pi} \sin x \, dx$ by dividing the range into 10 equal parts using

i) Trapezoidal rule,

ii) Simpson's $\frac{1}{3}$ rd rule.

[7+8]

6. Using Runge Kutta method of fourth order find $y(0.2)$, $y(0.4)$ and $y(0.6)$ given $\frac{dy}{dx} = y - x$, $y(0) = 2$ taking $h = 0.2$. [15]

- 7.a) Find a Fourier series to represent $f(x) = x^2$, in $(-\pi, \pi)$. Hence show that

$$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$$

- b) Find the half range cosine series for $f(x) = Kx$ in $(0, 5)$. [7+8]

8. Solve the following partial differential equations:

a) $\frac{x^2}{p} + \frac{y^2}{q} = z$

b) $x^2 p + y^2 q = z^2$. [7+8]

---ooOoo---