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END TERM EXAMINATION

FIRST SEMESTER [B.TECH] FEBRUARY-MARCH 2023

Paper Code: ICT-101 **Subject: Programming for Problem Solving**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No.1 which is compulsory.

Q1 Attempt all questions (5x3=15)

a) What is the difference between compilation and interpretation? Explain the process of execution of a programme.

b) What is data type? Explain different data types used in C.

c) What is loop control statement? Explain with example.

d) What is the difference between structure and union?

e) What is stack? Explain with example.

Q2 a) What are modify operators? Explain it's use with example. (7.5)

b) Explain the concept of Switch case statement with proper example. (7.5)

Q3 What is multi dimensional arrays. Write a program to multiply two matrices by accepting two matrices as a input from the user. (15)

Q4 a) What is pointer? Explain pointer arithmetic concept with example. (7.5)

b) Write a program to explain the concept of call by value and call by reference. (7.5)

Q5 a) Define structure? Explain the concept of passing structure through functions with example. (7.5)

b) What is file handling in C? How many ways or modes a file can be opened. Explain with example. (7.5)

Q6 a) What is self referential structure? Explain with example. (7.5)

b) What is dynamic memory allocation? Explain. (7.5)

Q7 a) Write a program for selection sort and explain the logic (7.5)

b) Explain the logic of binary searching algorithm. (7.5)

Q8 a) What is storage classes available in C. Explain the concept (7.5)

b) Explain the concept of single linked list with example. (7.5)

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END TERM EXAMINATION

FIRST SEMESTER [B.TECH] MARCH 2023

Paper Code: ICT-103 ***Subject: Electrical Science***

Time: 3 Hours ***Maximum Marks: 75***

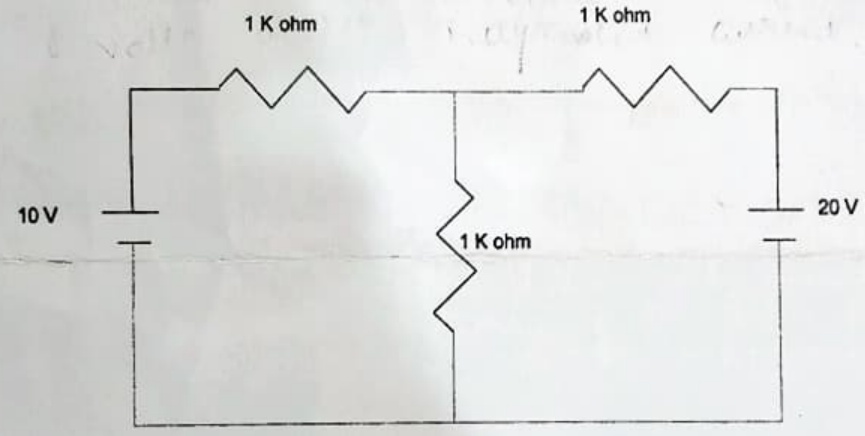
Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit.

Q1 Attempt **all** questions:- **(3x5=15)**

(a) Explain active and passive circuit components.
(b) Explain R-L-C series circuit with a voltage source. Write the equation and find current from the equations.
(c) Explain revolving magnetic field theory.
(d) Explain auto transformer.
(e) Explain Kirchhoff's current and voltage laws.

UNIT-I

Q2 Explain superposition theorem in details. Verify it for a T-network having all resistance value 1K ohmand voltage source 10V at one side and 20V at other side. **(15)**



Q3 Explain maximum power transfer theorem in details. Find the expression for maximum power transfer theorem and state the condition. **(15)**

UNIT-II

Q4 Explain three phase balanced circuit. Explain voltage and current relation in star and delta connection. **(15)**

Q5 Explain the parallel resonance of R, L and C circuit in details. **(15)**

UNIT-III

Q6 Explain the principal operation of generator and motor in details. Also explain the constructional feature difference between motor and generator. **(15)**

Q7 Explain the starting of Induction motor in details. Explain the difference between on line and star delta starters. **(15)**

UNIT-IV

Q8 Explain the construction and working principal of transformer in details. **(15)**

Q9 Write a short notes on:- **(7+8=15)**

(a) Moving Iron Instruments
(b) Dynamometer type Instruments

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ICT-103
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END TERM EXAMINATION

FIRST SEMESTER [B.TECH.] MARCH- 2023

Paper Code: BS-109 **Subject: Engineering Chemistry-I**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all. Select atleast one question from each unit.

UNIT-I

Q1 a) Define general form of the Schrodinger equation. What is a radial distribution function? Draw this function for the 3s and 2porbitals in a hydrogen atom. **(10)**

b) What are the geometric arrangements of $sp^3d^2$and dsp^2 hybrid orbitals? **(5)**

Q2 a) What is valence bond theory? Predict the structure of each of the following, and indicate whether the bond angles are likely to be distorted from the theoretical values: (i) $BeCl_2$;(ii) BCl_3; (iii) $SiCl_4$; (iv) PCl_5 (vapour) **(10)**

b) Account for the fact that there is a decrease in first ionization energy from Be to B, and Mg to Al. **(5)**

UNIT –II

Q3 a) Use the molecular orbital theory to explain why the bond strength in a N_2 molecule is greater than that in a F_2 molecule. **(5)**

b) What is electronegativity, and how is it related to the type of bond formed? **(5)**

c) What are Fajan's rules? **(5)**

Q4 a) What effect does temperature has on the rate of chemical reactions? **(5)**

b) State Hess's law of constant heat summation and explain some of its important applications? **(5)**

c) Calculate the heat of formation of acetic acid, if its heat of combustion is
-869.0 kJ mol^{-1}; the heats of formation of CO_2(g) and H_2O(l) are -390.0 kJ mol^{-1} and -285.0 kJ mol^{-1} respectively. **(5)**

Q5 a) Distinguish between **(10)**
i) Reaction Rate and Reaction Rate constant
ii) Average Rate and Instantaneous rate
iii) Order and Molecularity

b) Define enthalpy of neutralization and enthalpy of combustion. **(5)**

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BS-109
R/O

UNIT-III

Q6 a) Define H-bonding, discuss its types and effects on the physical and chemical properties of organic compounds. **(5)**

b) Arrange in increasing order and Give reasons: **(10)**

i) Acidity: FCH_2COOH, $ClCH_2COOH$, $BrCH_2COOH$, CH_3COOH

ii) Basicity: $PhNH_2$, RNH_2, R_2NH, R_3N

iii) Stability: 3°, 2°, 1° carbocations

iv) Carbanions: $^-CH_2CH_3$, $^-CH_2CHO$

Q7 a) What is resonance and what are its effects in organic compounds? Draw the resonating structures of: **(10)**

i) Chlorobenzene

ii) Benzoic acid

iii) Aniline

iv) Anisole

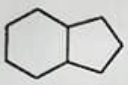
b) Write the IUPAC nomenclature of the following: **(5)**

i) $HO\text{-}CH{=}CH\text{-}CH{=}CH_2$

ii) $HSCH_2CH_2COOCH_2CH_3$

iii) $PhCH{=}CHCH_2OH$

iv) $OHCCH_2CH{=}CHCH_2CH{=}CH_2$

v) 

UNIT-IV

Q8 a) Explain the following terms: **(10)**

(i) Asymmetry and chirality

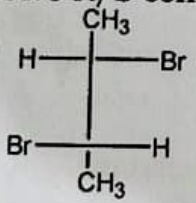
(ii) Enantiomers and Diastereomers mixture

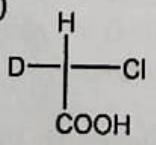
(iii) Meso compounds

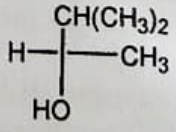
(iv) Geometrical isomers

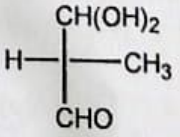
b) Draw all the possible conformations of cyclohexane and its potential energy diagram. **(5)**

Q9 a) Give R/S configuration for the following compounds: **(10)**

a) 

b) 

c) 

d) 

b) Draw the most stable conformations of n-butane and ethylene glycol. **(5)**

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END TERM EXAMINATION

FIRST SEMESTER [B.TECH.] MARCH 2023

Paper Code: HS-107 **Subject: Communication Skills-I**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt all questions. Internal choice is indicated.

Q1 Attempt both parts:

(a) Correct **any ten** of the following sentences if required (Or write No-change.): **(10)**

(i) If Gyan wouldn't have completed the work in time, I couldn't have paid him.
(ii) Shyamal told us who was she.
(iii) The dog ran fastly.
(iv) I have been studying here since two years.
(v) That is the most finest movie.
(vi) You are a better player than a singer.
(vii) The child refused to keep quite.
(viii) I had to make him to work hard.
(ix) This is one of my favourite book.
(x) I will meet him when he will come.
(xi) He sat besides his sister.
(xii) The work have to be completed by Monday.

(b) Do as directed (**Any five**): **(5)**

(i) Suman didn't wash her car. (Make it interrogative.)
(ii) It ... (rain)for three hours now. (Use appropriate form of the verb.)
(iii) That man is not much known to me. (Change the voice.)
(iv) He is ... busy .. . attand the party today. (Choose from 'so', 'too' and 'to'.)
(v) The enough I timely thank can't help you for. (Arrange the words to form a meaningful sentence.)
(vi) People ...(laugh) him in the party yesterday. (Use appropriate form of the verb.)

Q2 Write a paragraph on **one** of the following: **(15)**

Importance of Artificial Intelligence

OR

Honesty is the Best Policy

Q3 Attempt **any two** parts: **(7.5×2=15)**

(a) Write your resume for the post of Engineer in a reputed company. Imagine the relevant details.
(b) Your college organized a Technological Fest in the campus. Write a short Press-release. Imagine the relevant details.
(c) You want to purchase three air conditioners of 1.5 ton capacity each. Write a letter to Aircool Pvt. Ltd., Rohini, New Delhi. Imagine the relevant details.

P.T.O.

HS-107

Q4 Attempt **any two** parts: **(7.5×2=15)**

(a) Describe Steven Spielberg's idea of struggle and success referring to his speech at Harvard Commencement 2016.

(b) What is your understanding of development referring to Johan Rockstrom's talk on "Let the environment guide our development".

(c) Explain Johan Rockstrom's statement, "we're putting a quadruple squeeze on this poor planet."

Q5 Attempt **any three** parts: **(5×3=15)**

(a) Do as directed:

(i) We are discussing the topic covered in the previous class. (Change into Past Perfect tense.)

(ii) We posted the message to my mentor. (Make negative using 'could'.)

(iii) The minister said, "The new scheme seems to work well." (Change to indirect.)

(iv) I am beautifying my room. (Question tag)

(v) I ... (use to take/take) a long walk daily. (Choose the right option.)

(b) Difference between Descriptive and Argumentative types of writing?

(c) Difference between Paraphrasing and Summarizing

(d) Define is 'Agenda' and 'minutes' of meeting.

(e) The monthly meeting of Students Council is scheduled on Monday. Write a notice in this regard. Sign as Secretary of the Council.

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END TERM EXAMINATION

FIRST SEMESTER [B.TECH] MARCH 2023

Paper Code: ICT-105 **Subject: Engineering Mechanics**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Explain the following topics:- **(10x1.5=15)**

(a) Distinguish between perfect, deficient and redundant frames.

(b) Define angle of friction, angle of repose and cone of friction.

(c) Explain parallel axis and perpendicular axis theorem.

(d) State and proof method of resolution for the resultant force.

(e) A particle falls from rest and in the last second of its motion it passes 80 m. find the height from which it fell and the time of its fall. Take g = 9.81 m/s².

(f) Describe the method to find the velocity of a point on a link whose direction is known and the velocity of some other point on the same link in magnitude and direction is given.

(g) A train of weight 2500 kN is ascending a slope of 1 in 200 with a uniform velocity of 50 km/h. Find the power exerted by the engine if the track resistance is 10 N/kN weight of the train.

(h) A stone after falling 5 s from rest breaks a glass pane and in breaking it loses 40% of its velocity. How far will it fall in the next second? Take g = 9.81 m/s². Roller.

(i) Distinguish between ~~simply~~ support and hinged support beams with figures.

(j) Define uniformly distributed load and uniformly varying load.

UNIT-I

Q2 (a) Determine the position of the centroid for the lamina with a circle cutout as shown in Figure-1. **(7.5)**

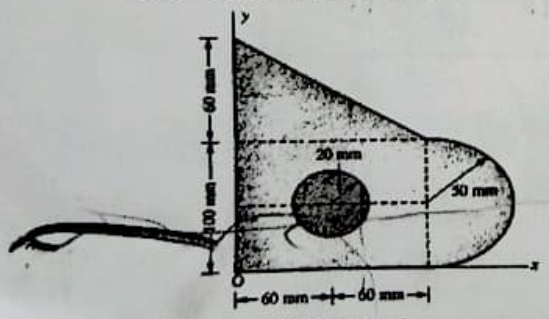

Figure-1

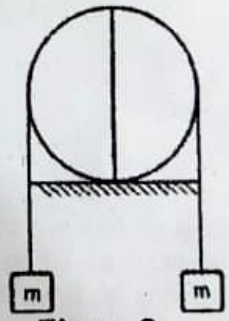

Figure-2

(b) Two halves of a round homogeneous cylinder is held together by a thread wrapped round the cylinder with two weights each equal to m attached to its ends as shown in Figure-2. The complete cylinder weighs W kgf. The plane of contact of both of its halves is vertical. Determine the minimum value of m, for which both halves of the cylinder will be in equilibrium on a horizontal plane. **(7.5)**

P.T.O.

ICT-105
P/1.

Q3 (a) Calculate the least radius of the gyration for the section as shown in Figure-3. **(7.5)**

(b) Two cylinders B and A of diameters 3 cm and 6 cm weighing 20 kN and 80 kN, respectively, are placed as shown in Figure-4. Assuming that all the contact surfaces are smooth, find the reactions at the walls. **(7.5)**

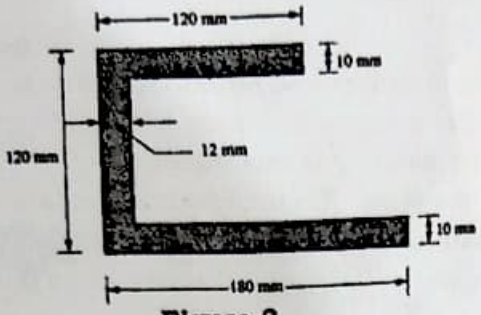

Figure-3

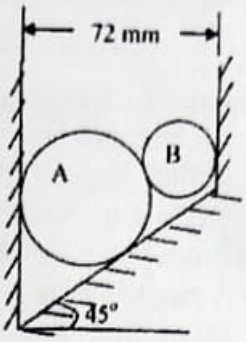

Figure-4

UNIT-II

Q4 (a) Derive the relationship between the tensions on the tight side and slack side of a belt passing over a rotating shaft. **(7.5)**

(b) A body resting on a rough horizontal plane required a pull of 200 N inclined at 30° to the plane just to move it. It was found a push of 220 N inclined at 30° to the plane just moved the body. Determine the weight of the body and the coefficient of friction. **(7.5)**

Q5 Compute the force in the members of the truss as shown in Figure-5 by the method of joints. **(15)**

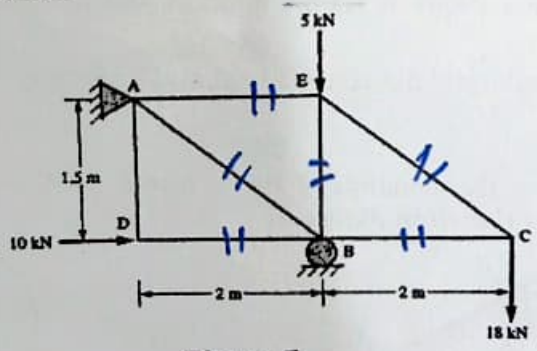

Figure-5

UNIT-III

Q6 (a) Two stones are thrown vertically upwards, one from the ground with a velocity of 10 m/s and the other from a point 40 m above with a velocity of 10 m/s. when and where will they meet? **(7.5)**

(b) A particle is projected upwards from location A with an initial velocity of 12 m/s (Figure-6). Find: **(7.5)**
(i) the maximum height above the ground that the particle attains, (ii) the velocity with which the particle passes point B and (iii) the velocity with which the particle strikes the ground.

P.T.O.

ICT105
P2/4

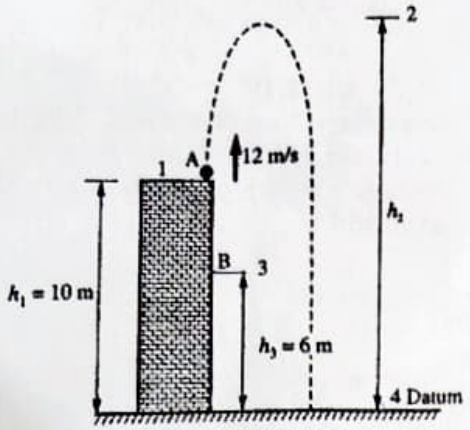

Figure-6

Q7 (a) A 600 gm ball A is moving with a velocity of magnitude 6 m/s when it is hit (as shown in Figure-7) by a 1 kg ball B which has a velocity of magnitude 4 m/s. knowing that the coefficient of restitution is 0.8 and assuming no friction, determine the velocity of each body after impact. **(7.5)**

(b) A 35 gm bullet B is fired with a velocity of 400 m/sec into the side of a 3 kg square panel suspended as shown (Figure-8) from a pin at A. Knowing that the panel is initially at rest, determine the components of the reactions at A after the panel has rotated 90°. **(7.5)**

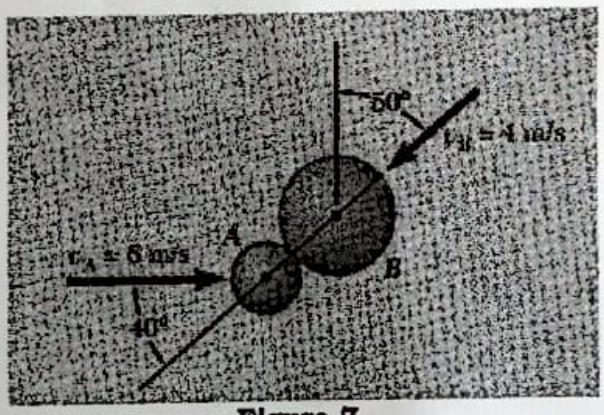

Figure-7

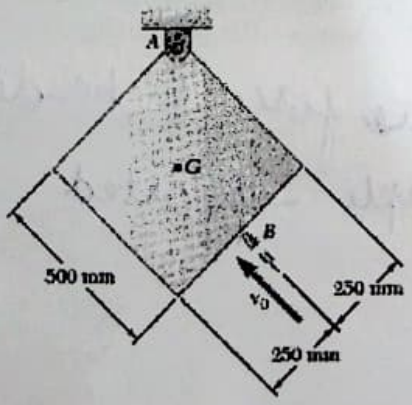

Figure-8

P.T.O.

ICT-105
P3M

UNIT-IV

Q8 A thin homogeneous triangular plate of mass 2.5 kg is welded to a light vertical axle supported by bearings at A and B. Knowing that the plate rotates at the constant rate $\omega = 8$ rad/s, as shown in Figure-9, determine the dynamic reactions at A and B. **(15)**

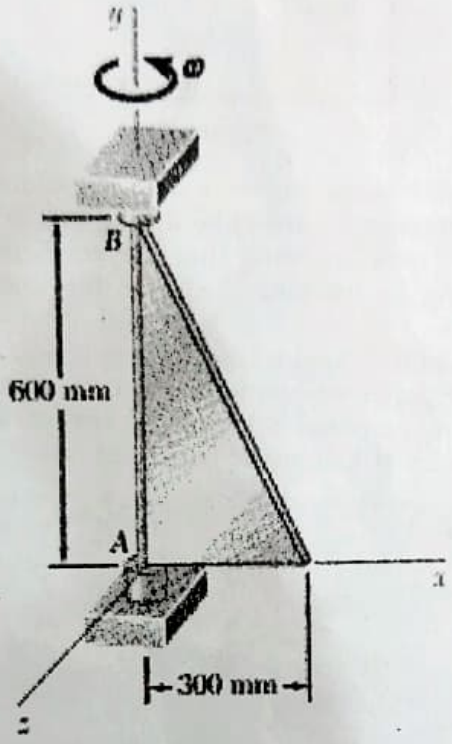

Figure-9

Q9 Define the followings:- **(15)**

(a) Work energy principle

(b) Simply supported beam subjected to couple with figure

(c) Different types of loads with proper figures

Draw shear force & bending mom. Dig for Siple supported

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ICT-105

P4/4

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END TERM EXAMINATION

FIRST SEMESTER [B.TECH] MARCH 2023

Paper Code: BS111 **Subject: Engineering Mathematics-I**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

Q1 (i) Find the rank of following matrix (3)

$$A = \begin{pmatrix} 2 & -4 & 6 \\ -1 & 2 & -3 \\ 3 & -6 & 9 \end{pmatrix}.$$

(ii) Let $\mathbf{F}(x, y, z) = (x^2\ 2xy\ z^2)$. Find $\nabla \cdot \mathbf{F}$ and $\nabla \times \mathbf{F}$. (3)

(iii) Solve the differential equation: $\frac{dy}{dx} = \frac{2x-y}{x+2y}$ (3)

(iv) Show that the differential equation $(2x + y)dx + (x - y)dy = 0$ is exact, and find its general solution. (3)

(v) Let $f(x, y) = \int_0^x e^{t^3+y^2} dt$. Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$. (3)

Unit-I

Q2a) If $z = tan(y + ax) + (y - ax)^{3/2}$, then show that (8)

$$\frac{\partial^2 z}{\partial x^2} = a^2 \frac{\partial^2 z}{\partial y^2}.$$

b) Find the extreme values of $u = x^2y^2 - 5x^2 - 8xy - 5y^2$. (7)

Q3a). Find the maximum value of $u = x^p y^q z^r$ when the variables x, y, z are subject to the condition $ax + by + cz = p + q + r$. (8)

b) Suppose x = u + v + w, y = u - v - w, and z = 2u + v - w. Find the Jacobian $\frac{\partial(x,y,z)}{\partial(u,v,w)}$ of the transformation from (x, y, z)-coordinates to (u, v, w)-coordinates. (7)

Unit-II

Q4a) Solve the differential equation: $y'' + 9y = 2\sin(3x)$. (8)

b) Solve the differential equation: $\frac{dy}{dx} + 3y = 2\sqrt{y}$, $y(0) = 4$. (7)

Q5a) Solve the initial value problem $x^2y'' - 2xy' + 2y = x^3, y(1) = 2, y'(1) = 1$. (8)

b) Find the general solution to the Bessel equation $x^2y'' + xy' + (x^2 - 1/4)y = 0$, using power series method. (7)

Unit-III

Q6a) Use Gauss-Jordan elimination to solve the system of linear equations:

$$x + 2y - 3z = 1 \quad 2x - y + z = 4 \quad 3x + y + 4z = -1.$$ (8)

b) Verify the Cayley-Hamilton theorem for the matrix $A = \begin{pmatrix} 1 & 2 \\ 2 & -1 \end{pmatrix}$ and hence find A^{-1}. (7)

Q7a) Find eigen values and corresponding eigen vectors of the matrix

$$A = \begin{pmatrix} -2 & 5 & 4 \\ 5 & 7 & 5 \\ 4 & 5 & -2 \end{pmatrix}.$$ (8)

b) Use Cramer's rule to solve the system of linear equations: (7)

$$x + 2y - z = 4 \quad 2x + y + z = 5 \quad 3x + 4y - 2z = 10.$$

Unit-IV

Q8a) Find the length of the curve given by $\mathbf{r}(t) = (t, t^2, t^3)$ for $0 \le t \le 1$. (8)

(b) Let $\mathbf{r}(t) = (\cos(t), \sin(t), t)$ be a curve in space. Find the curvature and torsion of the curve. (7)

Q9a) Let $\mathbf{F}(x, y, z) = (x^2, y^2, z^2)$. Use the Divergence Theorem to evaluate the surface integral $\iint_S \mathbf{F} \cdot d\mathbf{S}$, where S is the surface of the solid sphere $x^2 + y^2 + z^2 \leq 1$. (8)

(b) Use Green's Theorem to evaluate the line integral $\int_C \mathbf{F} \cdot d\mathbf{r}$, where $\mathbf{F}(x, y) = (x^2 y,\ x + y)$ and C is the boundary of the region D enclosed by the parabola $y = x^2$ and the line $y = x$. (7)

$\frac{dy}{dx} = \frac{x(2 - y/x)}{x(1 + 2y/x)} = \frac{2 - v}{1 + 2v}$

$\frac{x\,dv + v\,dx}{dx} = \frac{2 - v}{1 + 2v} \rightarrow x\frac{dv}{dx} + v = \frac{2 - v}{1 + 2v}$

$x \cdot \frac{dv}{dx} = -\frac{(2v^2 + 2v - 2)}{1 + 2v} \Rightarrow -1\int \frac{1 + 2v}{2v^2 + 2v - 1} \cdot dv = \log(x) + c$

Let $2v^2 + 2v - 1 = t \rightarrow \therefore -1\int \frac{dt}{2t} = \log(x) + c$

$\frac{dt}{2} = (2v + 1) \cdot dv \Rightarrow -\frac{1}{2}\log(t) = \log(x) + c$

$\Rightarrow -\frac{1}{2}\log(2v^2 + 2v - 1) = \log(x) + c$

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END TERM EXAMINATION

FIRST SEMESTER [B.TECH.] MARCH- 2023

Paper Code: BS-113 **Subject: Engineering Physics-I**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No1 which is compulsory. Given symbols have their usual meaning. Use missing data suitably, if any.

(5x3=15)

Q.1. Attempt **any five** of the following:

(a) State and explain Zeroth law of thermodynamics?

(b) What are absent spectra or missing orders in the diffraction obtained from N-slits?

(c) When light is incident on a glass plate at an angle of 56°, the reflected light is completely polarised. Find the refractive index of glass.

(d) Discuss superposition principle with example.

(e) What is Poynting vector? Write required expression.

(f) Two particles A and B are approaching each other with same speed 0.8c. What is the relative speed?

(g) What is double refraction?

(h) Why does two energy level system not support laser action in conventional lasers?

Q2 (a) Explain second law of thermodynamics. What are reversible and irreversible process? **(5)**

(b) Discuss the concept of entropy. Derive the general expression for the change of entropy of a perfect gas. **(6)**

(c) A 50 gram of water at $0^{\circ}C$ is mixed with an equal mass of water at $80^{\circ}C$. Calculate resultant increase entropy.

(Specific heat of water is 1 calorie/gram$\times^{\circ}C$) **(4)**

Q3 (a) What is simple harmonic oscillator? Write down the differential equation for simple harmonic oscillator with no damping force and solve it. **(5)**

(b) Derive electromagnetic wave equation of time varying electric field. An electromagnetic wave having amplitude 104 V/m polarised in x direction travels in z direction. Write real electric and magnetic field vectors. **(6)**

(c) In free space, the electric field of electromagnetic wave is given by $E(z,t)=100\cos(kz-\omega t)\hat{x}(V/m)$. Find the average power crossing a circular area of radius 1 m in yz plane. **(4)**

Q4 (a) What are the conditions of sustained interference? Discuss the Fresnel's Biprism to determine wavelength of light. **(5)**

(b) Discuss the construction and working of Michelson Morley interferometer. Explain the formation of circular fringes and localised fringes with major applications. **(6)**

P.T.O.

BS-113
P1/2

(c) Explain the necessity of extended source for thin films. On illuminating a wedge shape air film by light of wavelength 6000 Å, 20 fringes are seen in 2 cm. Find the angle of the wedge. Consider that the light is incident normally on the wedge. **(4)**

Q5 (a) Differentiate between Fresnel and Fraunhofer diffraction with examples. Justify that why is diffraction in sound waves observed in daily life as compared to light. **(5)**

(b) Obtain an expression for resultant intensity on screen due to the Fraunhofer diffraction of light from a single slit of width 'b' and show that the relative intensities of the maxima obtained in the diffraction pattern are nearly in the ratio of 1:1/22:1/61:1/121:.... **(6)**

(c) Compare the spectrum of prism and grating for incident visible light. **(4)**

Q6 (a) Define the polarisation of light and explain types of polarisation. Find the state of polarisation of light whose electric vector has the following components, $E_x = -E_0 \cos(\omega t), E_y = E_0 \sin(\omega t)$. **(5)**

(b) What is specific rotation? Discuss the construction and working of Laurent's half shade polarimeter. **(6)**

(c) Find the specific rotation of a sugar solution of concentration 20%, if 20 cm length of it causes the rotation of 26.4° in the plane of polarisation of light. **(4)**

Q7 (a) Derive the Einstein coefficients and explain the results. What are three and four energy level systems? **(6)**

(b) Describe the construction and working of Ruby Laser. Write the major applications of Ruby Laser. **(6)**

(c) Elaborate the properties of Laser light with examples. **(3)**

Q8 (a) Interpret the negative results of Michelson-Morley experiments. Show that two events that are simultaneous in one inertial system are not in general simultaneous in another. **(5)**

(b) Derive the Lorentz transformations formulae. An observer on a spacecraft moving at 0.700c relative to the earth finds that a car takes 40.0 minutes to make a trip. How long does the trip take to the driver of the car? **(6)**

(c) Explain mass energy equivalence. Two lumps of clay each of rest mass m, collide head on at (3/5)c . They stick together. What is the mass (M) of the composite lump? **(4)**

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