

CBCS SCHEME

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18MAT11

First Semester B.E. Degree Examination, Jan./Feb. 2023 Calculus and Linear Algebra

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Find the angle between the curves $r = a(1 + \cos \theta)$ and $r = b(1 - \cos \theta)$. (06 Marks)
b. Prove that the pedal equation to the curve $r^m = a^m \cos m \theta$ is $pa^m = r^{m+1}$. (07 Marks)
c. Show that the evolute of the parabola $y^2 = 4ax$ is $27ay^2 = 4(x - 2a)^3$. (07 Marks)

OR

- 2 a. Find the pedal equation to the cardioid $r = a(1 + \cos \theta)$. (06 Marks)
b. With usual notations prove that $\tan \phi = r \left(\frac{d\theta}{dr} \right)$. (07 Marks)
c. Find the radius of curvature of the curve $y^2 = \frac{a^2(a-x)}{x}$, where the curve meets X - axis. (07 Marks)

Module-2

- 3 a. Using Maclaurin's series prove that $\sqrt{1 + \sin 2x} = 1 + x - \frac{x^2}{2} - \frac{x^3}{6} + \frac{x^4}{24} \dots$ (06 Marks)
b. Evaluate $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right)^{1/x^2}$. (07 Marks)
c. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, Prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$. (07 Marks)

OR

- 4 a. Expand $\log(1 + \cos x)$ by Maclaurin's series upto term containing x^4 . (06 Marks)
b. Find the extreme values of the function $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$. (07 Marks)
c. If $u = x + y + z$, $v = y + z$, $uvw = z$, find the value of $\frac{\partial(x, y, z)}{\partial(u, v, w)}$. (07 Marks)

Module-3

- 5 a. Evaluate $\int_{-c}^c \int_{-b}^b \int_{-a}^a (x^2 + y^2 + z^2) dz dy dx$. (06 Marks)
b. Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$ by changing the order of integration. (07 Marks)
c. Prove that $\beta(m, n) = \frac{\Gamma(m) \cdot \Gamma(n)}{\Gamma(m+n)}$ (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ by double integration. (06 Marks)
- b. Find the volume bounded by the cylinder $x^2 + y^2 = 4$ and the planes $y + z = 4$ and $z = 0$. (07 Marks)
- c. Show that $\int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} \times \int_0^{\pi/2} \sqrt{\sin\theta} d\theta = \pi$. (07 Marks)

Module-4

- 7 a. Solve $[\cos x \tan y + \cos(x + y)]dx + [\sin x \sec^2 y + \cos(x + y)]dy$. (06 Marks)
- b. Solve $\frac{dy}{dx} - y \tan x = \frac{\sin x \cos^2 y}{y^2}$. (07 Marks)
- c. A body originally at 80°C cools down to 60°C in 20 minutes. If the temperature of the air is 40°C , find the temperature of the body after 40 minutes from the original. (07 Marks)

OR

- 8 a. Solve $y(2x - y + 1) dx + x(3x - 4y + 3) dy = 0$. (06 Marks)
- b. Show that the family of parabolas $y^2 = 4a(x + a)$ is self Orthogonal. (07 Marks)
- c. Solve $p(p + y) = x(x + y)$. (07 Marks)

Module-5

- 9 a. Find the rank of $\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & -1 & -1 \end{bmatrix}$ by Elementary row transformation. (06 Marks)
- b. Apply Gauss – Jordan method to solve the system of equations.
 $2x + 5y + 7z = 52$
 $2x + y - z = 0$
 $x + y + z = 9$. (07 Marks)
- c. Find the largest eigen value and the corresponding eigen vector of the matrix.
 $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ by Power method, taking the initial eigen vector as $[1, 1, 1]^T$. Perform 5 iterations. (07 Marks)

OR

- 10 a. Solve the following system of equations by Gauss Elimination method.
 $2x + y + 4z = 12$
 $4x + 11y - z = 33$
 $8x - 3y + 2z = 20$. (06 Marks)
- b. Solve the following system of equations by Gauss Seidel method.
 $10x + y + z = 12$
 $x + 10y + z = 12$
 $x + y + 10z = 12$. (07 Marks)
- c. Diagonalise the matrix $\begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$. (07 Marks)

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Second Semester B.E. Degree Examination, Jan./Feb. 2023 Advanced Calculus and Numerical Methods

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Find the Directional derivative of $\phi = xy^2 + yz^3$ at $(2, -1, 1)$ along $i + 2j + 2k$. (06 Marks)
- b. Find $\text{div } \vec{A}$, $\text{Curl } \vec{A}$, $\text{div}(\text{Curl } \vec{A})$, where $\vec{A} = x^2yi + y^2zj + z^2yk$. (07 Marks)
- c. If $u = x^2yz$, $v = xy - 3z^2$, then find $\nabla \cdot (\nabla u \times \nabla v)$. (07 Marks)

OR

- 2 a. Find the work done in moving a particle in the force field $\vec{F} = 3x^2i + (2xz - y)j + zk$ along the straight line from $(0, 0, 0)$ to $(2, 1, 3)$. (06 Marks)
- b. Using Divergence theorem, evaluate $\iiint_V \text{div } \vec{F} \, dV$, where V is the region bounded by the planes $x = 0$, $y = 0$, $z = 0$ and $2x + 2y + z = 4$. (07 Marks)
- c. Using Stoke's theorem, evaluate $\int_C (x + y)dx + (2x - y)dy + (y + z)dz$, where C is the boundary of the triangle with vertices $(2, 0, 0)$, $(0, 3, 0)$ and $(0, 0, 6)$. (07 Marks)

Module-2

- 3 a. Solve $(4D^4 - 4D^3 - 23D^2 + 12D + 36)y = 0$. (06 Marks)
- b. Solve $(D^2 - 4D + 3)y = e^{3x} + 2^x + 7$. (07 Marks)
- c. Using the method of variation of parameter, solve $(D^2 - 6D + 9)y = \frac{e^{3x}}{x^2}$. (07 Marks)

OR

- 4 a. Solve the differential equation $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 13y = \sin 2x + x$. (06 Marks)
- b. Solve $(1 - 2x)^2 y'' + 6(1 - 2x)y' + 16y = 4(1 - 2x)^2$. (07 Marks)
- c. The current i and the charge q in a series circuit containing an inductance L , capacitance C , e.m.f E satisfy the differential equation $L \frac{di}{dt} + \frac{q}{C} = E$, $i = \frac{dq}{dt}$. Express q in terms of t , given that L, C, E are constants and the value of i, q are both zero initially. (07 Marks)

Module-3

- 5 a. Find the partial differential equation by eliminating the function from $Z = f(x^2 + y^2) + x + y$. (06 Marks)
- b. Solve $\frac{\partial^3 z}{\partial x^2 \partial y} = 18xy^2 + \sin(2x - y)$. (07 Marks)
- c. Find all possible solution of $u_{tt} = c^2 u_{xx}$ one dimensional wave equation by Variable Separable method. (07 Marks)

OR

- 6 a. Solve $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} - 3z = 0$, $z = 1$, $\frac{\partial z}{\partial x} = 1$, when $x = 0$. (06 Marks)
- b. Find the general solution of $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$. (07 Marks)
- c. Derive one dimensional heat equation. (07 Marks)

Module-4

- 7 a. Test for converges for $\frac{2}{3} + \frac{2.3}{3.5} + \frac{2.3.4}{3.5.7} + \dots$ (06 Marks)
- b. With usual notation prove that $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$. (07 Marks)
- c. Express $f(x) = x^4 - 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomial. (07 Marks)

OR

- 8 a. Discuss the nature of the series $\frac{2}{3} + \left(\frac{3}{5}\right)^2 + \left(\frac{4}{7}\right)^3 + \dots \infty$. (06 Marks)
- b. Obtain the series solution of Legendre differential equation in terms of $P_n(x)$.
 $(1 - x^2)y'' - 2xy' + n(n + 1)y = 0$. (07 Marks)
- c. Show that i) $P_2(\cos \theta) = \frac{1}{4}(1 + 3 \cos 2\theta)$ ii) $P_3(\cos \theta) = \frac{1}{8}[3 \cos \theta + 5 \cos 3\theta]$. (07 Marks)

Module-5

- 9 a. Find the population of a town for the year 1974. Given that

| Year | 1939 | 1949 | 1959 | 1969 | 1979 | 1989 |
|-------------------------|------|------|------|------|------|------|
| Population in thousands | 12 | 15 | 20 | 27 | 39 | 52 |

- (06 Marks)
- b. Using Newton's general interpolation formula, find the polynomial and hence find $f(3)$.

| | | | | | | |
|---|----|----|----|----|----|----|
| x | 0 | 1 | 2 | 4 | 5 | 6 |
| y | 22 | 48 | 50 | 30 | 32 | 58 |

- (07 Marks)
- c. Using Newton Raphson method, find correct to 4(four) decimal places, the smallest root of $\log x = \cos x$. (07 Marks)

OR

- 10 a. Using Regula Falsi method, determine a solution of $2x = \cos x + 3$ correct to four decimal places. (06 Marks)
- b. Find the polynomial $f(x)$ using Lagrange's Interpolation formula for

| | | | | |
|---|---|----|----|-----|
| x | 1 | 3 | 4 | 6 |
| y | 0 | 12 | 33 | 135 |

Hence find $f(2)$. (07 Marks)

- c. Use Weddle's rule to find $\int_0^{0.6} e^{-x^2} dx$, by taking seven ordinates. (07 Marks)

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18PHY12/22

First/Second Semester B.E. Degree Examination, Jan./Feb. 2023 Engineering Physics

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Physical constants : $h = 6.625 \times 10^{-34}$ JS, $e = 1.602 \times 10^{-19}$ C, $K = 1.38 \times 10^{-23}$ J/K⁻¹,
 $m_e = 9.1 \times 10^{-31}$ kg, $c = 3 \times 10^8$ ms⁻¹, $g = 9.8$ ms⁻²
3. Use sketches and figures wherever necessary.*

Module-1

- 1 a. Explain Mechanical Simple Harmonic Oscillator and setup differential Equation for free oscillations starting from Hooke's law. (08 Marks)
b. What is a shock tube? Explain the construction and working of Reddy shock tube. (07 Marks)
c. A mass of 1Kg is attached to a massless spring with spring constant $4\pi^2$ Nm⁻¹ and is executing free oscillations. Calculate the natural frequency of the spring mass system. If the spring mass system is set to forced oscillations using a 1Hz source state the condition of forced oscillations. (05 Marks)

OR

- 2 a. Discuss the Theory of Forced oscillators. (10 Marks)
b. Enumerate the properties of shock waves. (05 Marks)
c. Compare the Mach number of a bullet moving with a velocity 400ms⁻¹ with a jet fighter traveling with a velocity 900km/hour given the velocity of sound in the medium 333ms⁻¹. (05 Marks)

Module-2

- 3 a. Explain Hooke's law of elasticity and explain stress Vs strain curve for an elastic material. (07 Marks)
b. Define Bending moment. Derive an expression for Bending moment of an uniform bar of Rectangular cross section. (08 Marks)
c. Given the Rigidity modulus of steel 80GPa, calculate the bulk modulus give the Poisson's ratio for steel 0.2. (05 Marks)

OR

- 4 a. Explain the three types of stresses and strains. (06 Marks)
b. Define couple per unit twist for the torsion of cylinder. Derive an expression for couple per unit twist for an uniform wire of circular cross-section. (09 Marks)
c. Determine the extension in a steel wire of length 2m and radius 1mm fixed rigidity to the ceiling and loaded at the other and with a mass of 5kg given Young's modulus of steel 210GPa. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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Module-3

- 5 a. Define Acceptance angle and Numerical aperture of an optical fiber and Derive an expression for Numerical Aperture with a neat ray diagram. (07 Marks)
- b. Elucidate the equation of continuity and Derive Maxwell-Ampere law. (08 Marks)
- c. Given $\vec{A} = (3x^2 - y + az)\hat{i} + (bx - 5y^2 - 2z)\hat{j} + (2x + cy + 3z)\hat{k}$.
Find a, b, c if \vec{A} is irrotational. (05 Marks)

OR

- 6 a. Define Displacement current Density and Derive an expression for displacement current using a simple AC circuit containing a capacitor and an AC source. (07 Marks)
- b. Starting with Maxwell's equations arrive at the wave equation for electromagnetic waves in Vacuum in terms of electric field. (08 Marks)
- c. Given the RI of core and cladding of an optical fiber are 1.5 and 1.49 respectively. Calculate the Numerical Aperture, Acceptance Angle and Fractional RI change in the fiber is replaced in air. (05 Marks)

Module-4

- 7 a. Mention any Five properties of matter waves. (05 Marks)
- b. Mention the requisites of a laser system and explain the construction and working of carbon dioxide LASER with the help of neat sketches. (10 Marks)
- c. Compare the de Broglie wavelength of an electron accelerated through a potential difference of 182V with that of an object of mass. 1 Kg moving with a speed of 1ms^{-1} . (05 Marks)

OR

- 8 a. Briefly explain the applications of LASER in Defense. (05 Marks)
- b. Discuss the motion of a particle in an one dimensional potential well of infinite height and of width 'a'. (10 Marks)
- c. Find the ratio of population of two energy levels in a medium at thermal equilibrium, if the wavelength of light emitted at 291K is 6928Å . (05 Marks)

Module-5

- 9 a. Define Fermi energy and density of states and derive an expression for Fermi energy at 0K. (08 Marks)
- b. Derive an expression for the electrical conductivity in semiconductors. (07 Marks)
- c. The electron and Hole mobilities of silicon are $0.15\text{m}^2\text{V}^{-1}\text{s}^{-1}$ and $0.04\text{m}^2\text{V}^{-1}\text{s}^{-1}$ respectively at a certain temperature. If the free e concentration in silicon is 1.5×10^{16} electrons m^{-3} calculate the resistivity of silicon. (05 Marks)

OR

- 10 a. Define Polar and non-polar dielectrics. Explain the types of polarization mechanisms. (08 Marks)
- b. Mention the failures of classical free electron theory of metals and explain the success of Quantum free electron theory of metals. (07 Marks)
- c. The Fermi Level for Silver (A_g) is 5.5eV what is the energy for while the probability of occupancy at 300K is 0.01. (05 Marks)

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18CHE12/22

First/Second Semester B.E. Degree Examination, Jan./Feb. 2023 Engineering Chemistry

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is single electrode potential? Derive the Nernst equation for single electrode potential. (06 Marks)
- b. What are concentration cells? The cell potential of Cu concentration cell $\text{Cu} | \text{CuSO}_4 (0.005 \text{ M}) || \text{CuSO}_4 (X) | \text{Cu}$ is 0.0295 V at 25°C. Write the cell reaction and calculate the value of X. (07 Marks)
- c. Explain the construction and working of Ni-MH battery. Mention its applications. (07 Marks)

OR

- 2 a. What is ion selective electrode? Explain the method of determining the pH of a given solution using glass electrode. (07 Marks)
- b. Write the cell reaction and calculate the emf of a cell at 298 K, if the standard electrode potential of Fe and Ag electrodes are -0.44 V and +0.8 V respectively.
 $\text{Fe} | \text{Fe}^{2+} (0.01 \text{ M}) || \text{Ag}^+ (0.1 \text{ M}) | \text{Ag}$ (07 Marks)
- c. Define the terms : (i) Free energy (ii) Entropy (iii) Cell potential. (06 Marks)

Module-2

- 3 a. What is metallic corrosion? Explain the electro-chemical theory of corrosion by taking iron as an example. (07 Marks)
- b. Explain the process of (i) Galvanization of zinc (ii) Anodizing of aluminium. (07 Marks)
- c. What is electroplating? Explain the electroplating of chromium. (06 Marks)

OR

- 4 a. What is meant by metal finishing? Mention any five technological importance of metal finishing. (06 Marks)
- b. What is electrolessplating process? Explain the electrolessplating of copper. (08 Marks)
- c. Explain the factors affecting the rate of corrosion :
(i) Nature of corrosion product
(ii) pH
(iii) Ratio of anodic to cathodic areas. (06 Marks)

Module-3

- 5 a. Define the term calorific value of the fuel? Explain the experimental determination of calorific value of solid or liquid fuel using Bomb calorimeter. (08 Marks)
- b. 0.80g of coal sample (containing Carbon : 90%, H₂ : 2.5% and Ash 7.5%) was subjected to combustion in a Bomb calorimeter. Mass of water taken in the calorimeter was 2200 g and the water equivalent of the calorimeter was 800g. The initial temperature of water : 25.52°C, final temperature of water : 34.43°C. Calculate gross and net calorific values of the coal sample. [Given specific heat of water = 4.187 kJ/kg/°C ; Latent heat of steam = 2454 kJ/kg] (08 Marks)
- c. Explain the construction and working of a typical PV cell. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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OR

- 6 a. What are fuel cells? Explain the construction and working of methanol oxygen fuel cell. Mention its advantages. (07 Marks)
- b. Explain the preparation of solar grade silicon by Union Carbide (UC) process. (07 Marks)
- c. What is knocking? Explain its mechanism, mention its ill effects. (06 Marks)

Module-4

- 7 a. Discuss the sources, environmental effects and control of sulphur dioxide pollution. (06 Marks)
- b. What are the causes, effects and disposal methods of e-waste? (07 Marks)
- c. In a COD test 28.5 ml and 13.5 ml of 0.05N FAS solution are required for blank and titration (sample) respectively. The volume of the test sample used was 25 ml. Calculate the COD of sample solution. (07 Marks)

OR

- 8 a. Define the term COD. Explain the determination of COD. (07 Marks)
- b. What is potable water? Explain the process of desalination of sea water by reverse osmosis. (06 Marks)
- c. Explain the ozone formation, depletion, role of CFCs and importance of ozone layer. (07 Marks)

Module-5

- 9 a. Explain the theory, instrumentation and applications of Flame Photometry. (07 Marks)
- b. Explain the theory and instrumentation of conductometry. (07 Marks)
- c. What are nano-materials? Explain the synthesis of nano-materials by chemical vapor deposition method. (06 Marks)

OR

- 10 a. Explain the size dependent properties of nano-materials (06 Marks)
- b. Write a short notes on : (08 Marks)
- i) Fullerenes (ii) Carbon nano-tubes (iii) Graphenes
- c. Explain the theory and instrumentation of colorimetry. (06 Marks)

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18CPS13/23

First/Second Semester B.E. Degree Examination, Jan./Feb. 2023

C Programming for Problem Solving

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the generations of computer. (05 Marks)
- b. Classify and explain the different types of computers based in size and storage. (06 Marks)
- c. Explain the following :
 - i) Input devices (any two)
 - ii) Output devices (any two)
 - iii) Primary memory and Secondary memory. (09 Marks)

OR

- 2 a. Explain the basic structure of C program with an example. (05 Marks)
- b. Define data type. List the different types of data type. Explain the primitive (Basic) data types with size and ranges. (07 Marks)
- c. Classify operators. Explain the following operator with example:
 - i) Arithmetic operator
 - ii) Increment and Decrement operator
 - iii) Conditional operator. (08 Marks)

Module-2

- 3 a. Explain about printf() and scanf() statements. (06 Marks)
- b. With simple program explain the following statement:
 - i) if else statement
 - ii) Nested if statement (08 Marks)
- c. Write a program that uses three coefficients (a, b & c) of a quadratic equation ($ax^2 + bx + c = 0$) as input and find the root of quadratic equation and print them with appropriate message. (06 Marks)

OR

- 4 a. Explain switch statement and develop a program to solve simple computational problem using arithmetic expression and use of each operator leading to simulation of a commercial calculator (No built in math function). (08 Marks)
- b. Differentiate between while and do while loop. (05 Marks)
- c. Explain how to build a Pascal's triangle. Write a C program to print Pascal's triangle. (07 Marks)

Module-3

- 5 a. Define Array. Explain how to declare, initialize and access the elements of one dimensional and two dimensional array with example. (08 Marks)
- b. Explain any five string manipulation library function with example. (06 Marks)
- c. Write a C program to read two matrices and find the multiplication of two matrices. (06 Marks)

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2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. What is searching? Explain binary search technique and develop a program to implement Binary Search. (08 Marks)
- b. Explain about i) Linear Search ii) Selection sort. (06 Marks)
- c. Develop a program to sort the given set of numbers using Bubble Sort. (06 Marks)

Module-4

- 7 a. Define function. Explain function prototype and function declaration. (05 Marks)
- b. Explain the following :
 i) Actual parameters
 ii) Formal parameters
 iii) Global variable
 iv) Local variable (10 Marks)
- c. Explain pass by value and pass by reference with functions. (05 Marks)

OR

- 8 a. What is recursion? Write a C program to compute factorial of a given number 'n' using recursion. (06 Marks)
- b. Develop a program to print Fibonacci series using recursion. (05 Marks)
- c. List the types of user defined function explain them. (09 Marks)

Module-5

- 9 a. Define structure. Explain how to define, initialize and access the structure variable. (08 Marks)
- b. With example explain about Array of Structure and Array within structure. (06 Marks)
- c. Implement structures to read, write and compute average marks of N students using structure. (06 Marks)

OR

- 10 a. What is a pointer? Explain how to declare and initialize pointer variable. (05 Marks)
- b. List and explain any 5 important preprocessor directives supported by C. (10 Marks)
- c. List out the advantages and disadvantages of pointer. (05 Marks)

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First/Second Semester B.E. Degree Examination, Jan./Feb. 2023 Basic Electrical Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. State KCL and KVL. (04 Marks)
- b. Obtain an expression for average value in text of maximum value for alternative quantity. (06 Marks)
- c. Two coils are connection in parallel and a voltage of 200V is applied between the terminals. The total current taken is 25A and power dissipated in one of the resistor in 1500W. Find the resistance of two coils. (10 Marks)

OR

- 2 a. Define the i) RMS value ii) Average value iii) Form factor iv) Peak factor. (08 Marks)
- b. Find the current in all branches.

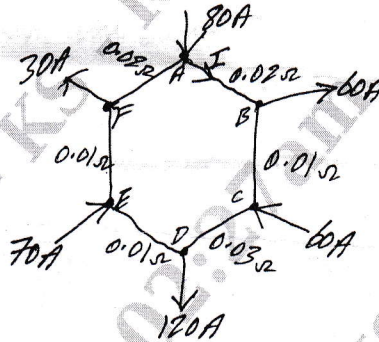


Fig Q2(b)

(12 Marks)

Module-2

- 3 a. Prove that in a purely inductive circuit the current lags voltage by 90° . Also obtain equation for power consumed in it with the relevant phasor diagram. (10 Marks)
- b. Obtain the relationship between line and phase value of current and voltage in 3 phase balanced Delta connected system with relevant phasor diagram. (10 Marks)

OR

- 4 a. With circuit diagram and phasor diagram show that in a 3 ϕ balanced circuit, two wattmeters are sufficient to measure the total 3 ϕ power for star connected load. (10 Marks)
- b. A circuit consists of resistance of 10Ω , an inductance of 16mH and a capacitance of $150\mu\text{f}$ connected in series. A supply of 100V at 50Hz is given to circuit. Find the current pf, power by the circuit. (10 Marks)

Module-3

- 5 a. Derive the emf equation for single phase transformer. (06 Marks)
- b. Explain the necessity of Earthing? With neat diagram explain the pipe earthing. (10 Marks)
- c. Write the precaution to be taken to prevent electric shock. (04 Marks)

OR

- 6 a. Explain two way and three way control to lamp with truth table and connection diagram. (10 Marks)
- b. Write the different losses in transformer and how to minimize it? (05 Marks)
- c. Find the efficiency of 150KVA 1- ϕ transformer at i) Full load, upf ii) 50% of full load, 0.8pf. If the copper loss at full load is 1500W and iron loss is 1200W. (05 Marks)

Module-4

- 7 a. Obtain an expression for emf generated in a DC generator. (06 Marks)
- b. A 4 pole DC shunt motor takes 22A from 220V supply. The armature and field resistances are respectively 0.5Ω and 100Ω . The armature is lap connected with 300 conductors. If the flux per pole is 20mwb, calculate the speed and gross torque. (10 Marks)
- c. What is back emf? State its significance? (04 Marks)

OR

- 8 a. Explain the various characteristics of dc series motors. Give two applications. (10 Marks)
- b. Obtain the torque equation of DC motor. (06 Marks)
- c. A 4 pole lap connected DC generator has 600 conduction and runs at 1200rpm if flux for pole 0.06wb. Calculate emf induced. Also find the speed at which it should drive to produce same emf when it is wave connected. (04 Marks)

Module-5

- 9 a. Explain with phasor diagram production of RMF in induction motor. (06 Marks)
- b. Define slip? Obtain the relation between slip frequency and rotor frequency. (06 Marks)
- c. The stator has 90 slots and 12 conductors per slot. The flux per pole is 0.5 wb. Calculate the time voltage generated by the machine if the winding factor is 0.97 and coil is full pitched. (08 Marks)

OR

- 10 a. Distinguish between the types of synchronous generator with diagram. (10 Marks)
- b. A 3 phase, 6 pole, 50Hz induction motor has a slip of 1% at no load and 3% at full load. Determine: i) synchronous speed ii) no load speed iii) full load speed iv) frequency of rotor current at stand still v) frequency of rotor current at full load. (06 Marks)
- c. State the advantages of rotating field over rotating armature in Alternator. (04 Marks)

GBCS SCHEME

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18ELN14/24

First/Second Semester B.E. Degree Examination, Jan./Feb. 2023 Basic Electronics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- Explain the operation of PN junction diode under forward and reverse bias condition. (08 Marks)
 - Explain Zener diode as a voltage regulator. (07 Marks)
 - In a centre tap FWR, the forward resistance of the diode is 10Ω , the load resistance is $2K\Omega$, the voltage across half the secondary winding is $220V$. Calculate the ripple factor and efficiency. (05 Marks)

OR

- With a neat circuit diagram and wave forms, explain the working of centre tapped FWR and derive the expression for ripple factor and efficiency. (08 Marks)
 - Write short notes on :
 - Photo diode
 - Light emitting diode. (08 Marks)
 - For the silicon diode shown in Fig.Q2(c). Calculate the current I_F for $R_1 = 4.7K\Omega$.

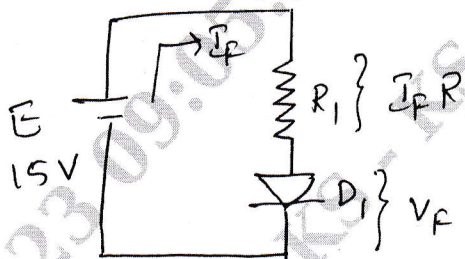


Fig.Q2(c)

(04 Marks)

Module-2

- Explain the construction and operation of JFET with necessary diagrams. (08 Marks)
 - Draw and explain VI characteristics of SCR. (07 Marks)
 - For JFET, if $I_{DSS} = 9mA$, and $V_{GS(off)} = -8V(max)$, calculate the value of I_D for $V_{GS} = 0$, and $V_{GS} = -1V$. (05 Marks)

OR

- With a neat diagram, explain the two transistor model of SCR. (06 Marks)
 - Explain the working of CMOS inverter. (06 Marks)
 - Explain the construction of enhancement type MOSFET. (08 Marks)

Module-3

- Describe the characteristics of basic op-amp. List its ideal characteristics. (08 Marks)
 - Derive the expression for output of inverting amplifier. (07 Marks)
 - Design an adder circuit using an op amp to obtain an output voltage of $v_0 = -[3v_1 + 4v_2 + 5v_3]$. (05 Marks)

OR

- 6 a. Derive the expression for output voltage for the following :
 i) Integrator ii) Voltage follower. (08 Marks)
 b. Derive the expression for 3 input inverting summing amplifiers. (08 Marks)
 c. An op-amp has a differential voltage gain of 100000 and common mode gain of 0.25. Determine the CMRR and express in decibels. (04 Marks)

Module-4

- 7 a. What is amplifier? Explain transistor as an amplifier. (08 Marks)
 b. Define feedback amplifier. Explain different types of feedback amplifier. Derive the voltage gain for voltage series feedback. (12 Marks)

OR

- 8 a. Explain the operation of Wein-bridge oscillator. Derive the expression for frequency of Oscillation. (08 Marks)
 b. Explain the working of astable oscillator using $I_C = 555$ timer. (07 Marks)
 c. Explain transistor as a switch. (05 Marks)

Module-5

- 9 a. Convert the following :
 i) $(186.75)_{10} = (?)_2 = (?)_{16}$
 ii) $(11010.01101)_2 = (?)_{10} = (?)_{16}$. (08 Marks)
 b. Simplify the following expressions and draw the logic circuit using basic gates.
 i) $AB + \overline{ABC} + \overline{ABC} + \overline{ABC}$
 ii) $(A + B)(A + C)$. (06 Marks)
 c. Realize full adder using two half adders. (06 Marks)

OR

- 10 a. What is multiplexer? Explain the working of 4 : 1 multiplexer. (07 Marks)
 b. What is flipflop? Explain the working of JK flipflop. (07 Marks)
 c. What is shift register? Explain the working of 4 bit shift register. (06 Marks)

CBCS SCHEME

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18ME15/25

First/Second Semester B.E. Degree Examination, Jan./Feb. 2023 Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks: 100

- Note : 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Steam Tables is permitted.

Module-1

- 1 a. Explain briefly the principle of working of Nuclear Power plant. (08 Marks)
b. The enthalpy of 1kg of steam of 70 bar is 2680 kJ. What is the condition of steam? (04 Marks)
c. Explain the following terms in relation to steam : i) Sensible Heat ii) Latent Heat
iii) Enthalpy of steam iv) Dryness fraction. (08 Marks)

OR

- 2 a. Briefly explain the Formulation of steam with Temperature – Enthalpy diagram. (08 Marks)
b. Explain with a neat sketch the working of Wind mill. (08 Marks)
c. Differentiate between Bio Fuels and Petroleum Fuels. (04 Marks)

Module-2

- 3 a. Differentiate between Fire Tube Boiler and Water Tube Boiler. (04 Marks)
b. Briefly explain the working principle of Pelton wheel turbine, with a neat sketch. (08 Marks)
c. List the various Boiler mounting and Accessories and mention its usage. (08 Marks)

OR

- 4 a. Explain the construction and working of Lancashire Boiler, with a neat sketch. (10 Marks)
b. How pumps are classified? With a neat sketch, explain the working of Centrifugal pump. (10 Marks)

Module-3

- 5 a. Give the classification of IC Engines. (04 Marks)
b. Briefly explain the working of Room Air Conditioner. (08 Marks)
c. Define the following terms :
i) Ton of Refrigeration ii) COP iii) Ice making effect iv) Air conditioner. (08 Marks)

OR

- 6 a. Explain the construction and working of a 2 stroke SI engine with neat sketch. (10 Marks)
b. A single cylinder 4 – stroke IC engine has the following details :
Bore - 180mm ; Stroke – 200mm ; Rated speed – 300 rpm
Torque on the Brake drum – 200 N.m ; Mean effective pressure – 6 Bar.
It consumes 4 kg of fuel per hour. The calorific value of Fuel = 42000 kJ/kg.
Determine
i) Indicated power ii) Brake power iii) Mechanical Efficiency
iv) Indicated Thermal Efficiency v) Brake Thermal Efficiency. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8=50, will be treated as malpractice.

Module-4

- 7 a. Define Composite material and how are composite materials classified. (04 Marks)
 b. With a neat sketch, explain the working principle of TIG welding. (08 Marks)
 c. Power is to be transmitted from one shaft to another shaft by means of Belt drive. The diameter of the larger pulley is 600mm and that of smaller pulley is 300mm. The distance between the centres of 2 pulleys is 3 mt. If the axes of the 2 shafts are in the same plane and parallel to each other, find the length of the belt required for
 i) Open Belt drive ii) Crossed Belt drive. (08 Marks)

OR

- 8 a. Enumerate the advantages and disadvantages of Gear drive over Belt drive. (04 Marks)
 b. Briefly explain about Thermo plastics and Thermo setting plastics. (08 Marks)
 c. With a neat sketch, briefly explain the working principal of Arc welding. (08 Marks)

Module-5

- 9 a. How a Lathe is specified? (04 Marks)
 b. Explain the basic elements of Core machine with a block diagram. (08 Marks)
 c. With the help of a neat diagram, explain the Industrial Robot Anatomy. (08 Marks)

OR

- 10 a. Explain with a neat sketch, the Taper Turning Operation on a Lathe by Tail Stock Offset method. (08 Marks)
 b. Differentiate between Open Loop and Closed Loop Control System. (04 Marks)
 c. Explain briefly the following Machining Operation :
 i) Thread cutting ii) Facing iii) Angular Milling iv) End Milling. (08 Marks)

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First/Second Semester B.E. Degree Examination, Jan./Feb. 2023 Elements of Civil Engineering & Engineering Mechanics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1. a. Explain briefly the scope of the following civil engineering fields:
 - (i) Structural Engineering (08 Marks)
 - (ii) Geo-Technical Engineering (05 Marks)
 - (iii) Transportation Engineering
 - (iv) Environmental Engineering
- b. State and prove parallelogram law of forces.
- c. Determine the magnitude, direction and position of the resultant force with reference to point A for the non-coplanar force system shown below in Fig. Q1(c).

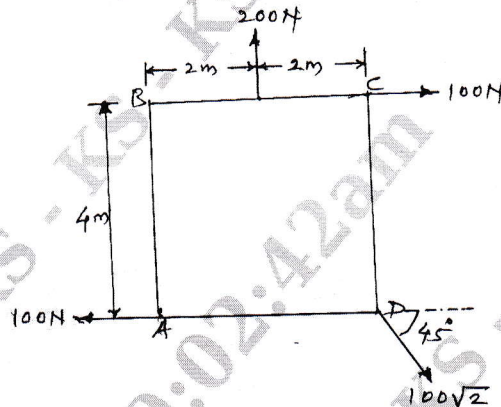


Fig. Q1 (c)

(07 Marks)

OR

2. a. State and prove Varignon's theorem. (06 Marks)
- b. Explain briefly impact of civil engineering infrastructure development on the social and economic development of a country. (06 Marks)
- c. A system of four forces acting at a point on a body is as shown in Fig.Q2 (c). Determine the magnitude and direction of resultant.

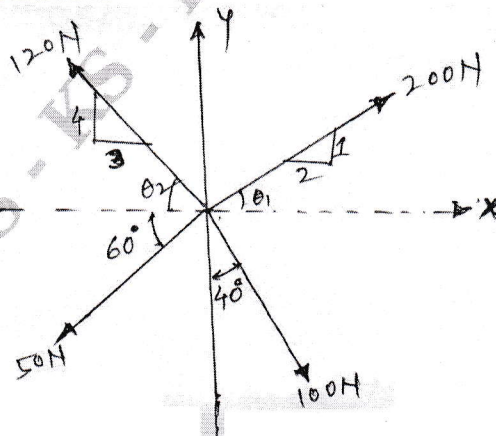


Fig. Q2 (c)

(08 Marks)

Module-2

- 3 a. State and prove Lami's theorem. (06 Marks)
 b. State the laws of static friction. (06 Marks)
 c. Two identical cylinders each weighing 500 N are placed in a trough as shown in Fig. Q3 (c). Determine the reactions developed at contact points A, B, C and D. Assume all points of contact are smooth.

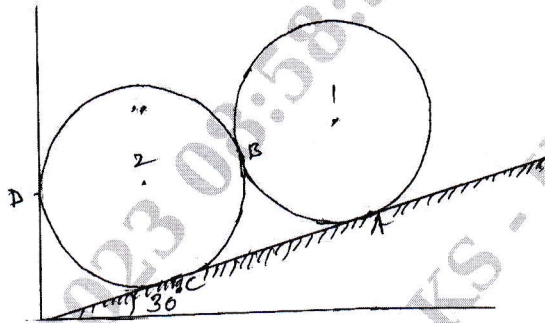


Fig. Q3 (c)

(08 Marks)

OR

- 4 a. Define : (i) Angle of friction (ii) Angle of repose (iii) Co-efficient of friction (iv) Cone of friction (08 Marks)
 b. Mention the equations of equilibrium for following force systems:
 (i) Co-planar concurrent force system.
 (ii) Co-planar non concurrent force system
 (iii) Co-planar parallel force system
 (iv) Non-coplanar force systems. (04 Marks)
 c. What is the value of P in the system shown in Fig. Q4 (c) to cause the motion to impend? Assume the pulley is smooth and co-efficient of friction between the other contact surfaces is on 0.2.

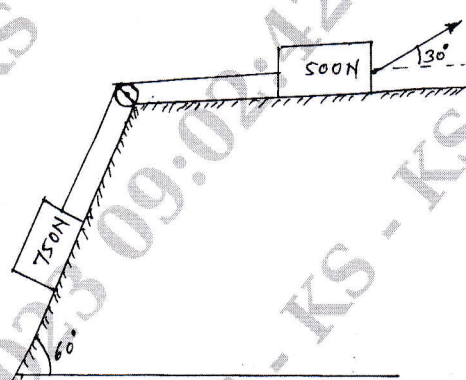


Fig. Q4 (c)

(08 Marks)

Module-3

- 5 a. Define the following:
 (i) Statically determinate truss. (ii) Perfect truss.
 (iii) Deficient truss. (iv) Redundant truss (08 Marks)
 b. Mention the types of supports with neat sketch. (04 Marks)
 c. Determine the reactions at the supports for the beam as shown in Fig. Q5 (c).

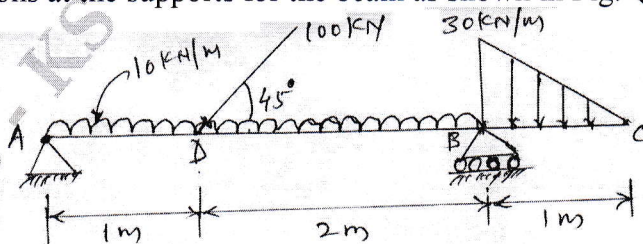


Fig. Q5 (c)

(08 Marks)

OR

- 6 a. Explain the types of loadings on the beam with neat sketches. (08 Marks)
 b. Determine the forces in all the members of the truss shown in Fig. Q6 (b) and tabulate the results.

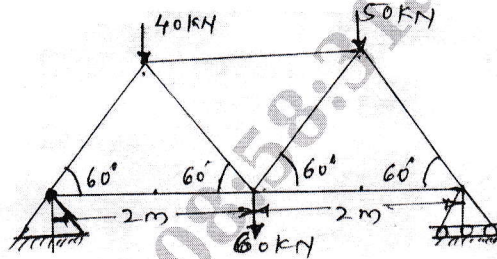


Fig. Q6 (b)

(12 Marks)

Module-4

- 7 a. State and prove the following theorems:
 (i) Parallel Axis theorem.
 (ii) Perpendicular Axis theorem (12 Marks)
 b. Locate the centre of the Shaded Area shown in Fig. Q7 (b).

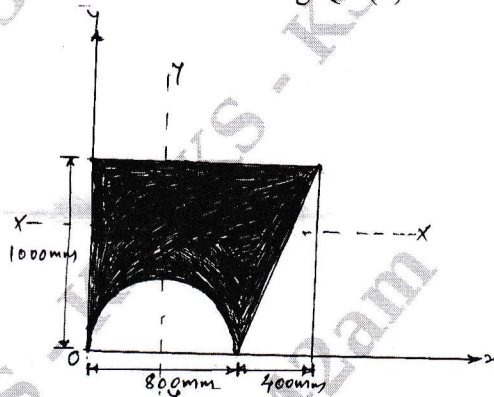


Fig. Q7 (b)

(08 Marks)

OR

- 8 a. Determine the centroid for sector of circle by the method of integration. (08 Marks)
 b. Determine the second moment of built up area shown in Fig. Q8 (b) about its horizontal centroidal axis and find corresponding radius of gyration (All dimensions are in mm)

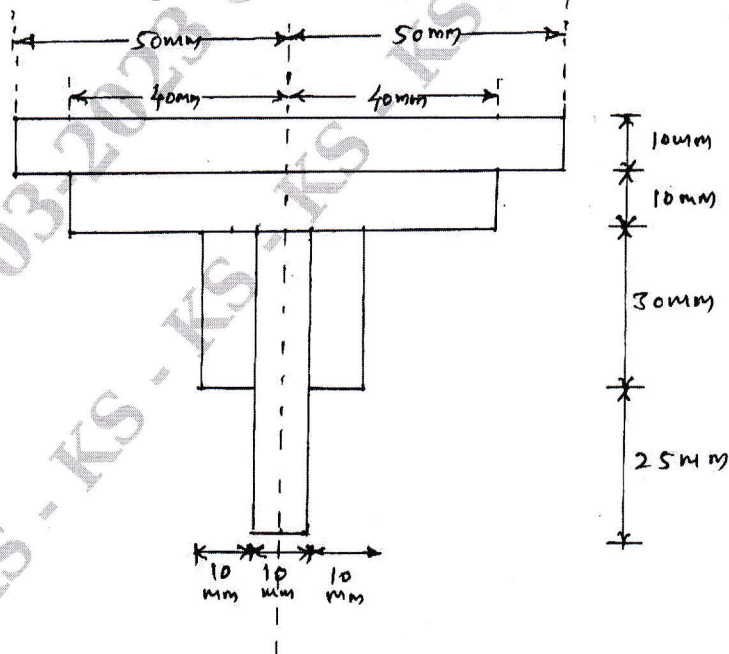


Fig. Q8 (b)

(12 Marks)

Module-5

- 9 a. Define the following :
- Displacement
 - Velocity
 - Acceleration
 - Rectilinear motion
- (04 Marks)
- b. What is super elevation and what is it's necessity? (04 Marks)
- c. A horizontal bar of length 1.5 m rotates. It accelerates uniformly from 1200 rpm to 1500 rpm in an interval of 5 seconds. Find the linear velocity at the beginning and end of the interval. What are the normal and tangential components of acceleration at the midpoint of bar after 4 seconds, after the acceleration begins. Refer Fig. Q9 (c)

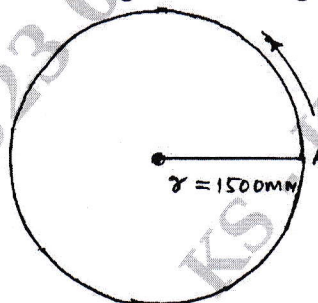


Fig. Q9 (c)

(12 Marks)

OR

- 10 a. State the D'Alembert's principle. (02 Marks)
- b. Two blocks A and B weighing 1200 N and 300 N are connected by a string and move along a horizontal rough plane by a horizontal force of 600 N as shown in Fig. Q10 (b). The co-efficient of friction for Block A is 0.25 and for block B is 0.3. Determine the tension in string and acceleration of the weight applying D'Alembert's principle.

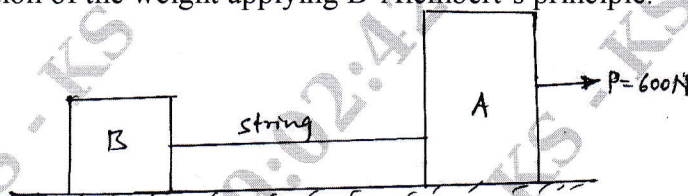


Fig. Q10 (b)

(08 Marks)

- c. A projectile is projected with a velocity of 250 m/sec at an angle of 60° with horizontal from the foot of plane having inclination of 30° . Determine the distance where the projectile will strike the plane (range) and time of flight taken. Take $g = 9.81 \text{ m/sec}$.

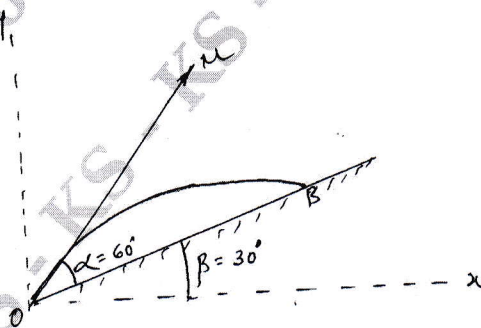


Fig. Q10 (c)

(10 Marks)
