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21MAT11

First Semester B.E. Degree Examination, Dec.2023/Jan.2024
Calculus and Differential Equations

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. With usual notation, prove that $\tan\phi = r\dfrac{d\theta}{dr}$. **(06 Marks)**

   b. Find the angle between the curves $r^n = a^n \cos n\theta$ and $r^n = b^n \sin n\theta$. **(07 Marks)**

   c. Find radius of curvature for the curve $x^3 + y^3 = 3axy$ at $\left(\dfrac{3a}{2}, \dfrac{3a}{2}\right)$. **(07 Marks)**

OR

2 a. Show that for Cardioid $r = a(1 + \cos\theta)$, $\dfrac{\rho^2}{r}$ = constant. **(06 Marks)**

   b. Find pedal equation of the curve $r^m = a^m(\cos m\theta + \sin m\theta)$. **(07 Marks)**

   c. Find radius of curvature of the curve $x = a\log(\sec t + \tan t)$, $y = a \sec t$. **(07 Marks)**

Module-2

3 a. Expand $\log(1 + \sin x)$ in powers of x upto terms containing x^4. **(06 Marks)**

   b. If $u = \dfrac{yz}{x}$, $v = \dfrac{zx}{y}$, $w = \dfrac{xy}{z}$, then show that $\dfrac{\partial(uvw)}{\partial(xyz)} = 4$. **(07 Marks)**

   c. If $u = e^{ax+by}.f(ax - by)$, show that $bu_x + au_y = 2abu$. **(07 Marks)**

OR

4 a. Evaluate $\underset{x\to 0}{\text{Lim}}\left(\dfrac{\sin x}{x}\right)^{\frac{1}{x^2}}$. **(06 Marks)**

   b. If $u = f(x - y, y - z, z - x)$ then show that $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z} = 0$. **(07 Marks)**

   c. Find the extreme values of $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$. **(07 Marks)**

Module-3

5 a. Solve $\dfrac{dy}{dx} + \dfrac{y}{x} = y^2 x$. **(06 Marks)**

   b. Find orthogonal trajectories of family of $r^n \cos n\theta = a^n$. **(07 Marks)**

   c. A body in air at 25°C cools from 100°C to 75°C in 1 minute. Find the temperature of body at the end of 3 minutes. **(07 Marks)**

OR

6 a. Solve $y(2xy + 1)dx - xdy = 0$. **(06 Marks)**

   b. Prove that the family of parabolas $y^2 = 4a(x + a)$ is self orthogonal. **(07 Marks)**

   c. Find the general solution of equation $(px - y)(py + x) = a^2 p$ by reducing into Clairaut's form taking the substitution $X = x^2$ and $Y = y^2$. **(07 Marks)**

Module-4

7 a. Solve $\dfrac{d^3y}{dx^3} - 6\dfrac{d^2y}{dx^2} + 11\dfrac{dy}{dx} - 6y = 2e^{3x}$. **(06 Marks)**

   b. Solve $\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} + y = x^2 + 2x$ **(07 Marks)**

   c. Using method of variation of parameter, solve $y'' - 2y' + y = \dfrac{e^x}{x}$. **(07 Marks)**

OR

8 a. Solve $\dfrac{d^3y}{dx^3} + y = 65\cos(2x + 1)$. **(06 Marks)**

   b. Solve $\dfrac{d^4y}{dx^4} - 16y = e^x$. **(07 Marks)**

   c. Solve $(1 + x)^2 y'' + (1 + x)y' + y = \sin[2\log(1 + x)]$. **(07 Marks)**

Module-5

9 a. Find Rank of the matrix
$$\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$
(06 Marks)

   b. Find the values of λ and μ for which the system of equations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ has (i) unique solution   (ii) infinitely many solution (iii) no solution. **(07 Marks)**

   c. Solve the system of equations by Gauss elimination method $x + 2y + z = 3$, $2x + 3y + 2z = 5$, $3x - 5y + 5z = 2$. **(07 Marks)**

OR

10 a. Find Rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$. **(06 Marks)**

   b. Apply Gauss Jordan method to solve $x + y + z = 9$, $2x - 3y + 4z = 13$, $3x + 4y + 5z = 40$. **(07 Marks)**

   c. Find the largest eigen value and corresponding eigen vector of $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ with initial approximate eigen vector $[1 \ 1 \ 1]^T$. **(07 Marks)**

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21MAT21

Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
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. Evaluate : $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz\, dz\, dy\, dx$. **(06 Marks)**

b. Evaluate $\int_0^\infty \int_0^x xe^{-x^2/y}\, dy\, dx$ by changing the order of integration. **(07 Marks)**

c. Prove that $\int_0^{\pi_2} \sqrt{\sin\theta}\, d\theta \times \int_0^{\pi_2} \dfrac{1}{\sqrt{\sin\theta}}\, d\theta = \pi$. **(07 Marks)**

OR

2 a. Evaluate $\iint_R xy\, dx\, dy$ over the region $\mathbb{R}$ bounded by the x-axis, ordinate x = 2a and the curve $x^2 = 4ay$. **(06 Marks)**

b. Find the area of the ellipse using double integration $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$. **(07 Marks)**

c. Derive the relation between Gamma and Beta functions $\beta(m.n) = \dfrac{\overline{|m}\,\overline{|n}}{\overline{|m+n}}$. **(07 Marks)**

Module-2

3 a. Find the directional derivative of $\phi = \dfrac{xz}{x^2+y^2}$ at the point (1, -1, 1) along the direction $\hat{i} - 2\hat{j} + \hat{k}$. **(06 Marks)**

b. Find the div $\vec{F}$ and curl $\vec{F}$ at the point (1, -1, 1) where $\vec{F} = \nabla(xy^3z^2)$. **(07 Marks)**

c. Find the constants a, b and c such that $\vec{F} = (axy - z^3)\hat{i} + (bx^2 + z)\hat{j} + (bxz^2 + cy)\hat{k}$ is irrotational. **(07 Marks)**

OR

4 a. Find the work done in moving a particle in the force field $\vec{F} = (2y - x^2)\hat{i} + 6yz\hat{j} - 8xz^2\hat{k}$ along the straight line from (0, 0, 0) to the point (1, 1, 1). **(06 Marks)**

b. Using the Green's theorem, evaluate $\int_c (2x^2 - y^2)dx + (x^2 + y^2)dy$, where 'c' is the triangle formed by the lines x = 0, y = 0 and y + x = 1. **(07 Marks)**

c. Using Stoke's theorem, evaluate $\int_s (\text{curl}\vec{f}).\hat{n}ds$ for $\vec{f} = (y - z + 2)\hat{i} + (yz + 4)\hat{j} - xz\hat{k}$, where s is the surface of the cube formed by the planes x = 0, y = 0, x = 2, y = 2 and z = 2 with its bottom removed. **(07 Marks)**

1 of 3

Module-3

5 a. Form a partial differential equation by eliminating arbitrary constants from $(x - a)^2 + (y - b)^2 = z^2$. **(06 Marks)**

b. Solve $\dfrac{\partial^3 z}{\partial x^2 \partial y} + 18xy^2 + \sin(2x - y) = 0$. **(07 Marks)**

c. With usual notation derive a one-dimensional wave equation. **(07 Marks)**

OR

6 a. Form the partial differential equation by eliminating arbitrary functions from
$\phi(xy + z^2, x + y + z) = 0$. **(07 Marks)**

b. Solve : $x(y^2 + z) p - y (x^2 + z) q = z(x^2 - y^2)$. **(07 Marks)**

c. Solve : $\dfrac{\partial^2 z}{\partial y^2} = z$, given that when $y = 0$, $z = 0$ and $\dfrac{\partial z}{\partial y} = \sin x$. **(06 Marks)**

Module-4

7 a. Using Regula-Falsi method, compute the real root which lies between 0.5 and 1 of the equation $\cos x = 3x-1$, correct to three decimal places. **(06 Marks)**

b. Find the number of students who obtained marks between 40 and 45 from the following data:

Marks:	30-40	40-50	50-60	60-70	70-80
Number of students:	31	42	51	35	31

(07 Marks)

c. Evaluate $\displaystyle\int_4^{5.2} \log_e^x \, dx$, using the Simpson's $1/3^{rd}$ rule, by dividing the interval into 6 equal parts. **(07 Marks)**

OR

8 a. By using Newton's – Raphson method find the real root of the equation $x \sin x + \cos x = 0$ near to $x = \pi$, correct to 3 decimal places (x is in radians). **(06 Marks)**

b. Using Newton's divided difference formula, find an interpolating polynomial which passes through the points (4, -43), (7, 83), (9, 327) and (12, 1058). **(07 Marks)**

c. Evaluate $\displaystyle\int_0^1 \dfrac{dx}{1 + x^2}$ by using the Simpson's $3/8^{th}$ rule, dividing the interval into six equal parts and hence deduce the value of π. **(07 Marks)**

Module-5

9 a. Using Taylor's series method find the solution of $\dfrac{du}{dx} = x^2 + y^2$, with $y(0) = 1$ at $x = 0.1$ and $x = 0.2$ of order four. **(06 Marks)**

b. Solve the initial value problem $\dfrac{dy}{dx} = x + y^2$; with $y(0) = 1$ at $x = 0.1$ by taking $h = 0.1$ using the Runge-Kutta method of order 4. **(07 Marks)**

c. Find the value y at $x = 1.4$ using Milne's predictor – corrector method given that, $\dfrac{dy}{dx} = x^2 + \dfrac{y}{z}$ with $y(1) = 2$, $y(1.1) = 2.2156$, $y(1.2) = 2.4649$ and $y(1.3) = 2.7514$. Apply corrector formula twice. **(07 Marks)**

OR

10 a. Using modified Euler's method, solve the initial value problem $\dfrac{dy}{dx} = \log_{10}\left(\dfrac{x}{y}\right)$; with

y(20) = 5 at x = 20.2 by taking h = 0.2 apply modification three times. **(06 Marks)**

b. Find the value of y at x = 0.1 given that $\dfrac{dy}{dx} = 3x + \dfrac{y}{z}$; y(0) = 1 by using Runge-Kutta

method of order 4. (Take h = 0.1). **(07 Marks)**

c. Find y(1.4) using Milne's predictor-corrector method given that $\dfrac{dy}{dx} = x^2(1+y)$; with

y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548 and y(1.3) = 1.979 apply corrector formula twice.
(07 Marks)

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21CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
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. Define standard electrode potential. Obtain the expression for single electrode potential. **(07 Marks)**
   b. What are ion-selective electrodes? Describe the construction and working of glass electrodes. **(07 Marks)**
   c. Explain the construction and working of Lithium-ion battery. Mention its applications. **(06 Marks)**

OR

2 a. Define battery. Give the classification of batteries with suitable examples. **(07 Marks)**
   b. What are reference electrodes? Explain the construction and working of Calomel electrode. Mention its applications. **(07 Marks)**
   c. Define cell potential. Calculate the standard electrode potential of copper at $25\,^\circ C$ when the potential of copper electrode is 0.296 V and $[Cu^{2+}] = 0.015M$. **(06 Marks)**

Module-2

3 a. Define corrosion. Explain the electrochemical theory of corrosion by taking iron as an example. **(07 Marks)**
   b. Explain with suitable example :
      (i) Differential metal corrosion
      (ii) Differential aeration corrosion **(06 Marks)**
   c. What is electrolessplating? Explain the electroless plating of copper. **(07 Marks)**

OR

4 a. What is meant by metal finishing? Mention any six technological importance of metal finishing. **(06 Marks)**
   b. Distinguish between electroplating and electrolessplating. **(07 Marks)**
   c. What is cathodic protection? Explain sacrificial anode and impressed current methods. **(07 Marks)**

Module-3

5 a. What are conducting polymers? Explain the mechanism of conduction in polyaniline. **(07 Marks)**
   b. Explain the synthesis and applications of polyurethane. **(06 Marks)**
   c. What are nanomaterials? Explain the synthesis of nanomaterial by precipitation method. **(07 Marks)**

OR

6 a. Explain any two size dependent properties of nano-materials. **(06 Marks)**
   b. Write a note on carbon nanotubes. Mention its properties and applications. **(07 Marks)**
   c. What are polymer composites? Explain the synthesis and applications of Kevlar fibre. **(07 Marks)**

Module-4

7 a. Briefly explain any six basic principles of green chemistry. **(06 Marks)**
   b. Explain the synthesis of paracetamol by conventional and green route from phenol.
   (07 Marks)
   c. What is photovoltaic cell? Explain the construction and working of photo voltaic cell. Mention its applications. **(07 Marks)**

OR

8 a. Describe the hydrogen production by photocatalytic water splitting method. **(07 Marks)**
   b. Explain microwave synthesis and Biocatalyzed reactions with suitable examples. **(07 Marks)**
   c. What is fuel cell? Explain construction and working of methanol-oxygen fuel cell. **(06 Marks)**

Module-5

9 a. Explain the theory, instrumentation and applications of potentiometry. **(07 Marks)**
   b. What is hardness of water? Explain the determination of hardness of water by EDTA method. **(07 Marks)**
   c. Define BOD. In a COD test 30.5 cm^3 and 19.3 cm^3 of 0.05 N FAS solution arc required for blank and sample titration respectively. The volume of test sample is 30.0 cm^3. Calculate the COD of the waste water sample. **(06 Marks)**

OR

10 a. Define the following units of standard solution :
   (i)   Normality
   (ii)   Molarity
   (iii) Mole fraction **(06 Marks)**
   b. What is COD? Explain the experimental determination of COD. **(07 Marks)**
   c. Explain the theory, instrumentation and applications of calorimetry. **(07 Marks)**

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First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
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 : Plank's constant= 6.625×10^{-34} J-S, Boltzmann's constant = 1.38×10^{-23} J/K, e = 1.6×10^{-19} C, C = 3×10^{8} m/s, g = $9.8 m/sec^{2}$, m_{e} = 9.1×10^{-31} Kg

Module-1

1 a. What are damped oscillations? Deduce the differential equation for damped oscillations arrive at the solutions give graphical representations of all the three cases. **(08 Marks)**

   b. What are shock waves? With a neat diagram, explain the construction and working of Reddy shock tube. **(08 Marks)**

   c. A mass of 0.8Kg causes an extension of 0.06m in a spring and mass system which is set for oscillations. Calculate force constant of the spring and time period of oscillations. **(04 Marks)**

OR

2 a. Discuss the theory of forced vibrations and hence obtain the expression for amplitude by solving the differential equation of forced oscillation. **(08 Marks)**

   b. What is spring constant? Mention its significance. Deduce the expression for equivalent spring constants, when two springs are connected in series and parallel. **(08 Marks)**

   c. While using a Reddy shock tube, it is found that the time taken to travel between two pressure sensors is 15μs. If the distance between two sensors is 10mm, find the Mach number. Assume that the velocity of sound in the medium is 340m/sec. **(04 Marks)**

Module-2

3 a. State and explain Plank's law of radiation. Explain how it changes to Wein's law and Rayleigh-Jeans law. **(08 Marks)**

   b. Mention the properties of wave function. Deduce Schrodinger's time independent wave equation. **(08 Marks)**

   c. The inherent uncertainty in the measurement of the time spent by iridium – 191 nuclei in the excited state is found to be 2.5×10^{-10} sec. Calculate the uncertainty that results in its energy in the excited state. **(04 Marks)**

OR

4 a. Solve the Schrodinger wave equation for the case of a particle in an infinite potential well and discuss its solutions? **(08 Marks)**

   b. Explain the spectrum of black body radiation. Prove that an electron does not exist inside the nucleus using Heisenberg's uncertainty principle. **(08 Marks)**

   c. Compute momentum and de-Broglie wavelength associated with an electron moving with kinetic energy 2KeV. **(04 Marks)**

Module-3

5   a. Derive an expression for energy density of incident radiation interms of Einstein's coefficients. **(08 Marks)**

b. What is angle of acceptance and numerical aperture of an optical fiber? Deduce the expression for Numerical aperture of optic fiber and mention the condition for ray propagation. **(08 Marks)**

c. Find the attenuation in an optic fiber of length 600m when a light of power 150mW incident and emerges out with 140mW power. **(04 Marks)**

OR

6   a. Describe construction and working of CO_2 laser with a neat energy level diagram. **(08 Marks)**

b. Explain different modes of propagation in optic fiber. Explain the optic fiber as temperature sensor. **(08 Marks)**

c. Ratio of population of two energy levels is 1.06×10^{-30}. Find the wavelength of light emitted by spontaneous emission at 310K. **(04 Marks)**

Module-4

7   a. Explain Hall effect. Deduce the expression for Hall voltage and Hall coefficient. **(08 Marks)**

b. Explain different polarization mechanisms in dielectrics. Briefly explain internal fields in solid dielectrics. **(08 Marks)**

c. The resistivity of intrinsic germanium at 27ºC is equal to 0.47Ωm. Assuming electron and hole mobilities as 0.36 and $0.17 m^2 V^{-1} S^{-1}$ respectively, calculate intrinsic carrier density. **(04 Marks)**

OR

8   a. Derive the expression for electrical conductivity in metals using quantum free electron theory. Explain any two success of quantum free theory. **(08 Marks)**

b. State and explain Fremi energy? Deduce the expression for Fermi energy at zero Kelvin **(08 Marks)**

c. Find the temperature at which there is 1% probability that a state with an energy 0.5eV above Fermi energy is occupied. **(04 Marks)**

Module-5

9   a. With a neat diagram, explain the principle, construction and working of Atomic force microscope. **(08 Marks)**

b. Explain the principle, construction and working of transmission electron microscope using a neat labelled diagram. **(08 Marks)**

c. Write a note on nano-composites. Give two examples. **(04 Marks)**

OR

10   a. Give the principle instruction and working of X-ray diffraction meter. **(08 Marks)**

b. Explain the principle, construction and working of scanning electron microscope with a neat labelled diagram. **(08 Marks)**

c. Determine the crystal size ; given, the wavelength of X-rays 10nms, the peak width of $0.5º$ and peak position of 25º and K = 0.94 for a cubic crystal? **(04 Marks)**

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21ELE13/23

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
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 Ohm's law. Mention its limitations. **(06 Marks)**

 b. Define RMS value of an alternating quantity. Obtain an expression for it interms of maximum value. **(07 Marks)**

 c. A resistance of 10 Ω is connected in series with two resistances each of 15 Ω arranged in parallel. What resistance must be shunted across this parallel combination so that the total current taken shall be 1.5 A with 20 V applied. **(07 Marks)**
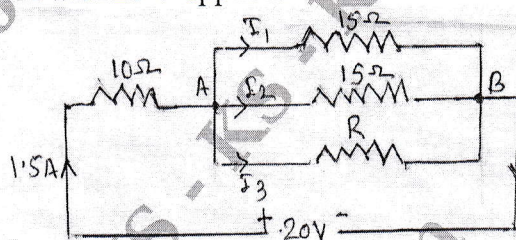

Fig. Q1 (c)

OR

2 a. Illustrate with examples, Kirchoff's laws as applied to an electric circuit. **(06 Marks)**

 b. Analyze the relationship between voltage and current, when AC is applied to pure resistive circuit and also draw the waveforms for voltage current and power. **(07 Marks)**

 c. An emf given by $400\sin 418t$ is applied to a certain circuit. The current taken is $2.4\sin(418t-1.37)$. Find
  (i)   Frequency
  (ii) Phase angle between voltage and current
  (iii) The resistance of the circuit. **(07 Marks)**

Module-2

3 a. Analyse the R-L series circuit when AC is applied. Draw the phasor diagram. **(06 Marks)**

 b. Develop the relation between line and phase values of current and voltage, write 3-φ power equation for star connected 3-phase system. **(07 Marks)**

 c. A voltage of 200 V is applied to a series circuit consisting of a resistor, an inductor and a capacitor. The respective voltages across these components are 170, 150 and 100 V and the current is 4 A. Find the power factor of the circuit. **(07 Marks)**

OR

4 a. With respect to AC circuit, explain Real Power, Reactive power and Apparent power and mention their units. **(06 Marks)**

 b. Show that 2 wattmeters are sufficient to measure power in a 3-phase balanced star connected circuit with the aid of neat circuit diagram and phasor diagram. **(07 Marks)**

 c. When a 3-phase balanced impedances are connected in star across a 3-phase 415 V, 50 Hz supply. The line current drawn is 20 A at a lagging pf of 0.4. Determine the parameters of the impedances in each phase. **(07 Marks)**

Module-3

5 a. With neat sketch, explain the constructional details of DC generator. **(06 Marks)**

b. Discuss the constructional details and working principle of the single phase transformer. **(07 Marks)**

c. A 4-pole DC shunt motor takes 22 A from 220 V supply. The armature and field resistances are respectively 0.5 Ω and 100 Ω. The armature is lap connected with 300 conductors. If the flux per pole is 20 mwb, calculate the speed and gross torque. **(07 Marks)**

OR

6 a. Discuss the characteristics of shunt and series motors and mention atleast one application. **(06 Marks)**

b. Derive the expression for emf of single phase transformer. List the various losses of the transformer. **(07 Marks)**

c. A 125 KVA transformer has a primary voltage of 2000 V at 60 Hz. Primary turns are 182 and the secondary turns are 40. Neglecting losses calculate
   (i) No load secondary emf
   (ii) Full load primary and secondary currents
   (iii) Flux in the core. **(07 Marks)**

Module-4

7 a. Derive the emf equation for synchronous generator with usual notations. **(06 Marks)**

b. Define slip of an induction motor and derive expression for rotor current frequency. **(07 Marks)**

c. A 6-pole 3 phase star connected alternator has an armature with 90 slots and 8 conductor per slot and revolves at 1000 rpm, the flux per pole being 0.05 weber. Calculate the emf generated if the winding factor is 0.97 and $K_C = 1$. **(07 Marks)**

OR

8 a. With the help of 3-phase waveforms show that the magnetic field in 3-phase induction motor is rotating in nature having constant magnitude. **(06 Marks)**

b. Discuss the comparative study between salient and non-salient synchronous generator. **(07 Marks)**

c. If the emf in the stator of an 8-pole induction motor has a frequency of 50 Hz and that in the rotor 1.5 Hz, at what speed is the motor running and what is the slip? **(07 Marks)**

Module-5

9 a. Discuss the concept of power transmission and power distribution with single line diagram. **(06 Marks)**

b. Discuss working of fuse and MCB. **(07 Marks)**

c. Describe the operation of RCCB with its benefits. **(07 Marks)**

OR

10 a. Define electric shock and mention safety precautions to avoid shock. **(06 Marks)**

b. Explain the construction of plate earthing with neat sketch. **(07 Marks)**

c. A 1000 W electric gyser is used for 1 hour, 10 bulbs each of 40 W for 5 hours per day by a consumer. Calculate the cost of electricity at the price 8.50 / unit. **(07 Marks)**

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21PSP13/23

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
Problem Solving Through Programming

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 basic structure of C program with example. **(10 Marks)**
   b. Define computer. Describe various types of computer. **(10 Marks)**

OR

2 a. List all the logical operators. Write a C program to demonstrate the working of logical operators. **(10 Marks)**
   b. Explain different components of computer with neat labelled diagram. **(10 Marks)**

Module-2

3 a. Explain the syntax of "if ..else if else" ladder (cascading if else). Also write a C program to perform the simple calculator operations like addition, subtraction, multiplication, division and modulus using "if else if else" statement. **(10 Marks)**
   b. Different between while and Do-while loop. **(05 Marks)**
   c. Write a C program to print sum of 'N' natural numbers. **(05 Marks)**

OR

4 a. Write the syntax of 'while loop' and write a C program to check whether the given number is palindrome or not. **(10 Marks)**
   b. Explain ternary operator with suitable example. **(05 Marks)**
   c. Write a C program to check whether the given number is prime or not. **(05 Marks)**

Module-3

5 a. Define array. Explain the declaration and initialization of single dimensional array with example. **(10 Marks)**
   b. Write a C program to search an integer using Binary search technique. **(10 Marks)**

OR

6 a. How are strings initialized and declared? Also explain any 5 string manipulation functions. **(10 Marks)**
   b. Write a program to sort given integer using bubble sort technique. **(10 Marks)**

Module-4

7 a. Discuss different types of functions with example. **(10 Marks)**
   b. What is recursion? Write a C program to compute factorial of a number using recursion. **(10 Marks)**

OR

8 a. Define Function. What are the advantages of user defined functions? **(10 Marks)**
   b. Explain different types of storage class specifiers. **(10 Marks)**

Module-5

9 a. Give the general syntax to initialize a structure with the example to store book information. **(06 Marks)**

b. How union is different from structure? **(06 Marks)**

c. Implement structure to read, write and compute average marks of n students. **(08 Marks)**

OR

10 a. What is a pointer? Discuss pointer arithmetic with suitable examples. **(06 Marks)**

b. Narrate the purpose of various C language pre-processor directives with examples. **(06 Marks)**

c. Write a C program to swap two integer values using pointers. **(08 Marks)**

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CBCS SCHEME

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21ELN14/24

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
Basic Electronics and Communication Engineering

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1   a. Explain AC to DC power supply with the neat block diagram. (10 Marks)
    b. Write a note on different types of amplifiers. Also define the voltage gain and current gain. (10 Marks)

OR

2   a. Mention the different characteristics of an operational amplifier. (07 Marks)
    b. Explain wein bridge oscillator. (07 Marks)
    c. Explain operational amplifier configurations. (06 Marks)

Module-2

3   a. Explain the different basic logic gates. (06 Marks)
    b. With the help of timing diagram, explain how RS bistable element works. (07 Marks)
    c. Design full adder circuit using basic gates. (07 Marks)

OR

4   a. With a neat block diagram, explain the working of 4-bit binary counter. (10 Marks)
    b. Define multiplexer and explain 4:1 multiplexer with circuit diagram. (10 Marks)

Module-3

5   a. Bring out the classification in Embedded Systems
       i) Based on generations
       ii) Based on complexity and performance requirements. (10 Marks)
    b. Bring out the differences between Harvard and Von-Neumann architecture. (05 Marks)
    c. Explain WiFi communication interface. (05 Marks)

OR

6   a. With the help of neat block diagram, explain an instrumentation system. (07 Marks)
    b. What are sensors? Write a note on the following sensors (i) Temperature sensor (ii) Sand sensor. (06 Marks)
    c. Explain 7-segment LED display with common anode configuration. (07 Marks)

Module-4

7   a. Define sampling theorem and explain when aliasing takes place and how can it be avoided. (07 Marks)
    b. Define an antenna and discuss different types of an antenna. (07 Marks)
    c. Define and explain SNR, Noise figure, channel types and amplitude modulation. (06 Marks)

OR

8   a. Discuss the various multiple access techniques used in a cellular network. (10 Marks)
    b. Explain Forward Error Correction and Automatic Repeat Request. (10 Marks)

Module-5

9   a. Bring out the features of FM transmitter and FM receiver and repeaters in microwave communication. **(10 Marks)**

b. With the help of a block diagram, explain the generalized configuration of a fiber-optic communication system. **(10 Marks)**

OR

10 a. Define the following terms in GSM system :
   i) Base Station Subsystem (BSS)
   ii) Mobile Station (MS)
   iii) Network Switching System (NSS) **(06 Marks)**

b. Based on orbits, discuss the different types of satellites. **(07 Marks)**

c. Write a note on LTE-A system architecture **(07 Marks)**

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21CIV14/24

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
Elements of Civil Engineering and Mechanics

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Briefly explain the scope of the following fields of civil engineering:
   (i)   Surveying
   (ii) Transportation
   (iii) Structural engineering   (10 Marks)
   b. Explain the role of civil engineer in the infrastructure development of the country. (10 Marks)

OR

2 a. List various building materials and explain any three building materials.   (10 Marks)
   b. State the scope of following civil engineering fields:
   (i)   Environmental engineering
   (ii) Water resource and irrigation engineering
   (iii) Geotechnical engineering   (10 Marks)

Module-2

3 a. State and prove Varignon's theorem.   (05 Marks)
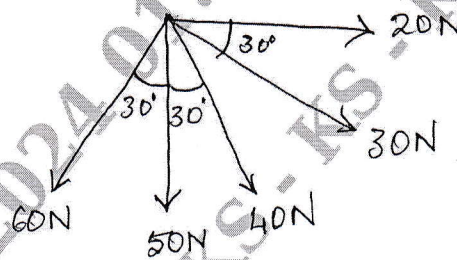   b. Determine magnitude and direction of the resultant of the given force system shown in Fig.Q3(b).

Fig.Q3(b)   (07 Marks)

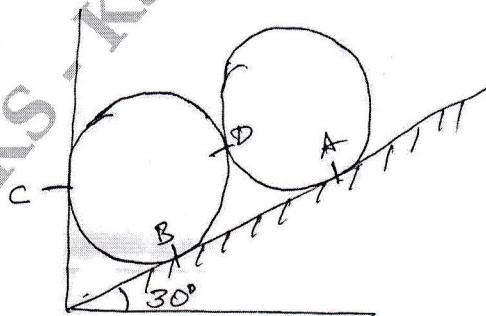   c. Find the reaction at the contact surfaces for two identical cylinders weighing 1000 N each as shown in Fig.Q3(c).

Fig.Q3(c)   (08 Marks)

OR

4 a. Determine the forces in the wires as shown in Fig.Q4(a).

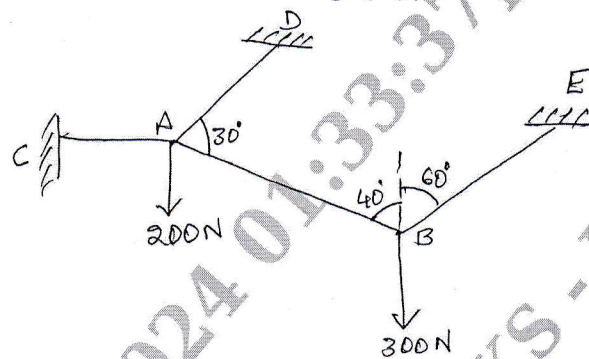Fig.Q4(a)   (05 Marks)

b. Two forces acting on a body are 500 N and 1000 N as shown in Fig.Q4(b). Determine the third force F such that the resultant of all the three forces is 1000 N directed at 45° to the X - axis.
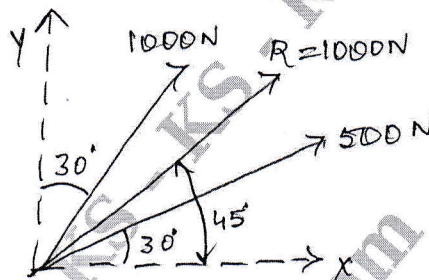

Fig.Q4(b)   (07 Marks)

c. Determine magnitude and position of the resultant force with respect to point "A" for the given force system shown in Fig.Q4(c).
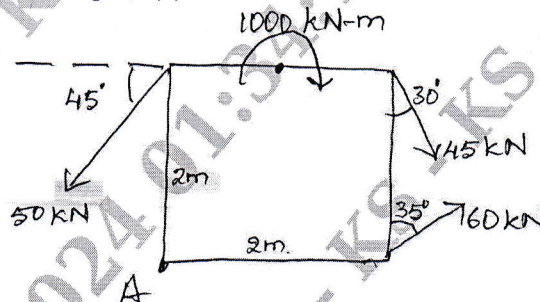

Fig.Q4(c)   (08 Marks)

Module-3

5 a. State and prove parallel axis theorem and perpendicular axis theorem.   (10 Marks)
   b. Determine the centroid of the lamina shown in Fig.Q5(b).

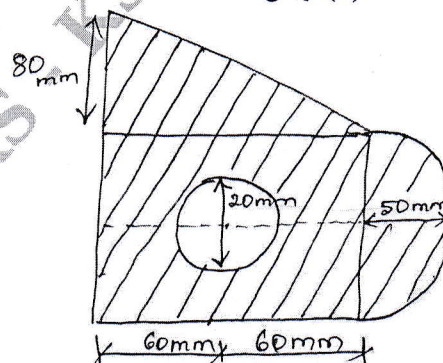Fig.Q5(b)   (10 Marks)

OR

6   a.   Determine the moment of inertia of the section at the centroidal xx and yy axis of the lamina shown in Fig.Q6(a).
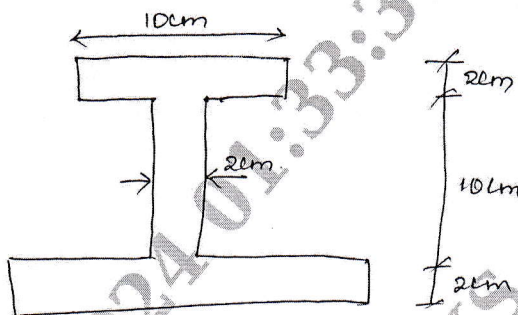

Fig.Q6(a)   **(10 Marks)**
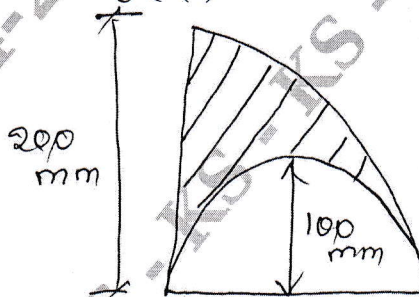
b.   Locate the centroid of given lamina Fig.Q6(b).

Fig.Q6(b)   **(10 Marks)**

Module-4

7   a.   Write the procedure to determine the member force by the method of sections.   **(08 Marks)**
    b.   Determine the support reactions for a beam loaded as shown in Fig.Q7(b).

Fig.Q7(b)   **(12 Marks)**

OR

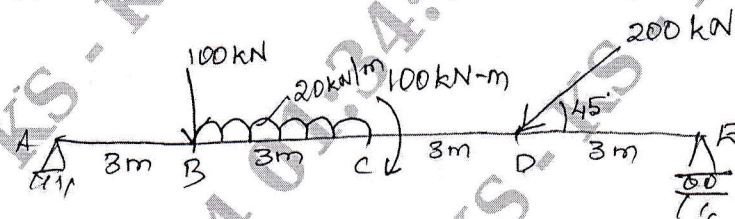8   a.   Explain different types of beams, types of supports and types of loads with sketches.
                                                                             (10 Marks)
    b.   Analyze the truss shown in Fig.Q8(b) by method of joints. Tabulate the results and indicate the nature of force in the truss.
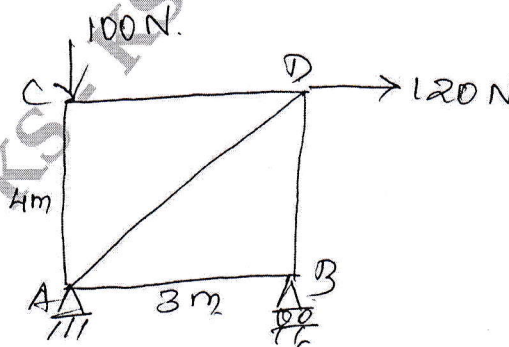

Fig.Q8(b)   **(10 Marks)**

Module-5

9 a. Define: (i) Motion   (ii) Distance   (iii) Displacement   (iv) Speed   (v) Velocity
   (vi) Acceleration   (vii) Retardation   (07 Marks)
   b. Write D'Alembert's principle and its applications.   (05 Marks)
   c. A projectile is fired from the edge of 150 m high cliff with an initial velocity of 180 m/s at
      an angle of elevation of 30° with horizontal. Neglecting the air resistance, find:
      (i) The greatest elevation above the ground reached by the projectile.
      (ii) The horizontal distance from the given to the point where the projectile strikes the
           ground.   (08 Marks)

OR

10 a. Define projectile and explain:
      (i) Velocity of projectile   (ii) Angle of projectile   (iii) Trajectory
      (iv) Horizontal range   (v) Time of flight   (07 Marks)
   b. Write about super elevation and its importance.   (05 Marks)
   c. A police officer observes a car approaching at the unlawful speed of 60 kmph. He gets on
      his motorcycle and starts chasing a car just as its passes in front of him. After accelerating
      for 10 secs at a constant rate, the officer reaches his top speed of 75 kmph. How long does it
      takes officer to overtake the car from the time he started?   (08 Marks)

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USN | | | | | | | | | | **21EME15/25**

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
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 table is permitted.

Module-1

1   a. Explain the formation of super heated stream from water at O°C, with relevant sketches and T-S diagram. **(10 Marks)**
    b. Compare renewable energy sources and non-renewable energy sources. **(04 Marks)**
    c. Find the enthalpy of 1kg of steam at 12 bar when,
       i) Steam is dry saturated
       ii) Steam at 22% wet
       iii) Superheated at 250°C
       Assume the specific neat of the super heated steam as 2.25kJ/ kg.k. **(06 Marks)**

OR

2   a. Describe the process of converting nuclear energy into electrical energy with a neat sketch. **(09 Marks)**
    b. Explain with a neat sketch Pelton wheel turbine. **(07 Marks)**
    c. List the applications of steam in industries. **(04 Marks)**

Module-2

3   a. What are composite materials and explain the main constituents of composite materials. **(06 Marks)**
    b. Discuss the process of oxy-acetlyene gas welding with a neat sketch. Also sketch the different flames. **(10 Marks)**
    c. Write short notes on piezoelectric materials. **(04 Marks)**

OR

4   a. With a neat sketch explain Tungsten Inert Gas [TIG] welding process. **(08 Marks)**
    b. Differentiate between welding brazing and soldering. **(06 Marks)**
    c. Explain different modes of heat transfer, with examples. **(06 Marks)**

Module-3

5   a. How chemical energy is converted into mechanical energy in four stroke petrol engine, explain with relevant sketches and P-V diagram. **(10 Marks)**
    b. Explain the important components of electric vehicles and list its advantages and disadvantages. **(10 Marks)**

OR

6   a. Define Ton of refrigeration. List the desirable properties of a refrigerant. **(06 Marks)**
    b. With a neat sketch explain how vapour absorption refrigeration system works. **(10 Marks)**
    c. Explain the principle of air conditioning. **(04 Marks)**

Module-4

7 a. List different configurations of a robot. Explain any two with appropriate diagrams.
   (09 Marks)
   b. Define machine and mechanism. **(04 Marks)**
   c. A simple gear train is made up of four gears, P, Q, R and S having 20, 40, 60 and 70 teeth respectively. if the gear P is the main driver rotating at 500rpm clockwise, calculate the following :
   i) Speed and direction of the last gear
   ii) Speeds of intermediate gear
   iii) Velocity ratio
   iv) Sketch the arrangement. **(07 Marks)**

OR

8 a. What is a gear drive? Explain with a neat sketches any three types of gear drive system.
   (10 Marks)
   b. With a necessary diagram, explain the components of a belt drive. **(05 Marks)**
   c. A turbine runs a generator at 1200rpm. The diameter of the turbine pulley and generator pulley are 1200mm and 400mm respectively. Find the velocity ratio and speed of the motor.
   (05 Marks)

Module-5

9 a. Explain the working principle of a lathe. List the applications of Milling and Drilling machine. **(08 Marks)**
   b. Explain how taper turning operation is performed by tailstock set-over method. **(07 Marks)**
   c. List and explain parts of a Milling machine. **(05 Marks)**

OR

10 a. Explain with a neat diagram, the components of CNC machine. **(10 Marks)**
   b. With a neat sketch explain open-loop and closed loop system. **(05 Marks)**
   c. Write short notes on smart manufacturing and industrial IOT. **(05 Marks)**

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