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18MAT11

First Semester B.E. Degree Examination, Aug./Sept.2020
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. With usual notation, prove that for the curve $r = f(\theta)$, $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$. **(06 Marks)**

b. Find the radius of curvature at any point P(x, y) on the parabola $y^2 = 4ax$. **(06 Marks)**

c. Show that the evolute of the parabola $y^2 = 4ax$ is $27ay^2 = 4(x - 2a)^3$. **(08 Marks)**

OR

2 a. Find the pedal equation of the curve $\frac{2a}{r} = 1 - \cos\theta$. **(06 Marks)**

b. Find the radius of curvature of the tractrix $x = a[\cos t + \log\tan(t/2)], y = a\sin t$. **(06 Marks)**

c. Show that the angle between the pair of curves: $r = 6\cos\theta$ and $r = 2(1 + \cos\theta)$ is $\pi/6$. **(08 Marks)**

Module-2

3 a. Using Maclaurin's series, prove that
$\sqrt{1+\sin 2x} = 1 + x - x^2/2! - x^3/3! + x^4/4!$ **(06 Marks)**

b. Evaluate: i) $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{1/x}$ ii) $\lim_{x\to 0}\left(\frac{a^x + b^x}{2}\right)^{1/x}$ **(07 Marks)**

c. Examine the function $f(x,y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$ for is extreme values. **(07 Marks)**

OR

4 a. If $U = f(x - y, y - z, z - x)$ show that $\frac{\partial U}{\partial x} + \frac{\partial U}{\partial y} + \frac{\partial U}{\partial z} = 0$. **(06 Marks)**

b. If $u = x\cos y\cos z$, $v = x\cos y\sin z$, $w = x\sin y$, then show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = -x^2\cos y$. **(07 Marks)**

c. Find the volume of the largest rectangular parallelopiped that can be inscribed in the Ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$. **(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. Find the volume of the solid bounded by the planes $x = 0, y = 0, z = 0, x + y + z = 1$ **(07 Marks)**

c. Show that $\beta(m,n) = \frac{\lceil m \lceil n}{\lceil m+n}$ **(07 Marks)**

OR

6 a. Change the order of Integration and hence evaluate $\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} xy\,dy\,dx$ **(06 Marks)**

b. Find the centre of gravity of the curve $r = a(1 + \cos\theta)$. **(07 Marks)**

c. Prove that $\int_0^{\pi/2}\sqrt{\sin\theta}\,d\theta \cdot \int_0^{\pi/2}\frac{d\theta}{\sqrt{\sin\theta}} = \pi$ **(07 Marks)**

Module-4

7 a. A body in air at 25°C cools from 100°C to 75°C in 1 minute. Find the temperature of the body at the end of 3 minutes. **(06 Marks)**

b. Find the orthogonal trajectories of the family of cardioides $r = a(1 + \cos\theta)$ **(07 Marks)**

c. Solve: $[4x^3y^2 + y\cos(xy)]dx + [2x^4y + x\cos(xy)]dy = 0$ **(07 Marks)**

OR

8 a. A series circuit with resistance R, inductance L and electromotive force E is governed by the differential equation $L\frac{di}{dt} + Ri = E$, where L and R are constants and initially the current i is zero. Find the current at any time t. **(06 Marks)**

b. Solve : $x^3\frac{dy}{dx} - x^2y = -y^4\cos x$ **(07 Marks)**

c. Solve : $x^2p^2 + xp - (y^2 + y) = 0$, where $p = \frac{dy}{dx}$. **(07 Marks)**

Module-5

9 a. Find the rank of the matrix $\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ by applying elementary row operations. **(06 Marks)**

b. Find the dominant 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 Rayleigh's power method taking the initial Eigen vector as $[1, 1, 1]^T$. **(07 Marks)**

c. Apply Gauss-Jordon method to solve the system of equations:
$2x + 5y + 7z = 52, \quad 2x + y - z = 0, \quad x + y + z = 9.$ **(07 Marks)**

OR

10 a. Test for consistency and solve:
$5x_1 + x_2 + 3x_3 = 20, 2x_1 + 5x_2 + 2x_3 = 18, 3x_1 + 2x_2 + x_3 = 14$ **(06 Marks)**

b. Reduce the matrix $A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ to the diagonal form. **(07 Marks)**

c. Solve the system of equations
$5x + 2y + z = 12$
$x + 4y + 2z = 15$
$x + 2y + 5z = 20$
Using Gauss-Siedel method [carry out 4 iterations]. **(07 Marks)**

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18MAT21

Second Semester B.E. Degree Examination, Aug./Sept.2020
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 angle between the surfaces $x^2 + y^2 - z^2 = 4$ and $z = x^2 + y^2 - 13$ at (2, 1, 2). **(06 Marks)**

b. If $\vec{F} = \nabla(xy^3z^2)$, find div $\vec{F}$ and curl $\vec{F}$ at (1,–1, 1). **(07 Marks)**

c. Find the value of the constant a such that the vector field

$\vec{F} = (axy - z^3)\hat{i} + (a-2)x^2j + (1-a)xz^2k$

is irrotational and hence find a scalar function ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

OR

2 a. If $\vec{F} = (3x^2 + 6y)i - 14yzj + 20xz^2k$, evaluate $\int_C \vec{F} \cdot d\vec{r}$ from (0, 0, 0) to (1, 1, 1) along the curve given by $x = t$, $y = t^2$ and $z = t^3$. **(06 Marks)**

b. Use Green's theorem to find the area between the parabolas $x^2 = 4y$ and $y^2 = 4x$. **(07 Marks)**

c. If $\vec{F} = 2xyi + yz^2j + xzk$ and s is the rectangular parallelopiped bounded by x = 0, y = 0, z = 0 and x = 2, y = 1, z = 3. Find the flux across S. **(07 Marks)**

Module-2

3 a. Solve $(D^2 + 3D + 2)y = 4\cos^2 x$. **(06 Marks)**

b. Solve $(D^2 + 1)y = \sec x \tan x$, by the method of variation of parameter. **(07 Marks)**

c. Solve $x^2y'' + xy' + 9 = 3x^2 + \sin(3\log x)$. **(07 Marks)**

OR

4 a. Solve $y'' + 2y' + y = 2x + x^2$. **(06 Marks)**

b. Solve $(2x + 1)^2y'' - 6(2x + 1)y' + 16y = 8(2x + 1)^2$. **(07 Marks)**

c. The current i and the charge q in a series circuit containing on inductance L, capacitance C, emf E satisfy the differential equation : $L\frac{di}{dt} + \frac{q}{c} = E$; $i = \frac{dq}{dt}$. Express q and i interms 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. Form the partial differential equation by eliminating the arbitrary function from $\phi(xy + z^2, x + y + z) = 0$. **(06 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ for which $\frac{\partial z}{\partial y} = -2\sin y$ when $x = 0$ and $z = 0$ if $y = (2n+1)\frac{\pi}{2}$. **(07 Marks)**

c. Derive one dimensional wave equation in the standard form $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$. **(07 Marks)**

OR

6 a. Form the partial differential equation by eliminating the arbitrary function form $f\left(\frac{xy}{z}, z\right) = 0$. **(06 Marks)**

b. Solve $\frac{\partial^2 z}{\partial y^2} = z$, given that when $y = 0$, $z = e^x$ and $\frac{\partial z}{\partial y} = e^{-x}$. **(07 Marks)**

c. Find all possible solutions of one dimensional heat equation $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$ using the method of separation of variables. **(07 Marks)**

Module-4

7 a. Test for convergence of the series $\sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!} x^n, (x > 0)$. **(06 Marks)**

b. Solve the Bessel's differential equation leading to $J_n(x)$. **(07 Marks)**

c. Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ interms of Legendre's polynomials. **(07 Marks)**

OR

8 a. Test for convergence of the series $\sum_{n=1}^{\infty} \frac{n^2}{2^n}$. **(06 Marks)**

b. If α and β are two distinct roots fo $J_n(x) = 0$. Prove that $\int_0^1 x J_n(\alpha x) J_n(\beta x) dx = 0$. If $\alpha \neq \beta$. **(07 Marks)**

c. Express $f(x) = x^3 + 2x^2 - x - 3$ interms of Legendre's polynomials. **(07 Marks)**

Module-5

9 a. Find the real root of the equation : $x^3 - 2x - 5 = 0$ using Regula Falsi method, correct to three decimal places. **(06 Marks)**

b. Use Lagrange's formula, find the interpolating polynomial that approximates the function described by the following data :

x	0	1	2	5
f(x)	2	3	12	147

c. Evaluate $\int_0^1 \frac{x\,dx}{1+x^2}$ by Weddle's rule, taking seven ordinates and hence find $\log e^2$.

OR

10 a. Find the real root of the equation $xe^x - 2 = 0$ using Newton – Raphson method correct to three decimal places.

b. Use Newton's divided difference formula to find f(4) given the data :

x	0	2	3	6
f(x)	–4	2	14	158

c. Use Simpson's $\frac{3}{8}^{th}$ rule to evaluate $\int_1^4 e^{1/x} dx$.

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18PHY12/22

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
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 : $h = 6.62 \times 10^{-34}$ JS ; $C = 3 \times 10^{8}$m/s ; $K = 1.38 \times 10^{-23}$ J/K ; $N_A = 6.02 \times 10^{26}$/K mole ; $M_e = 9.1 \times 10^{-31}$ kg ; $e = 1.6 \times 10^{-19}$C ; $g = 9.8$ m/s ; $\mu_O = 4\pi \times 10^{-7}$ H/m ; $\epsilon_O = 8.852 \times 10^{-12}$ F/m.*

Module-1

1 a. Discuss the theory of forced oscillations and obtain an expression for Amplitude resonance. **(10 Marks)**

b. Define shock waves and mention the applications of shock waves. **(06 Marks)**

c. The distance between the two pressure sensors in a shock tube is 150mm. The time taken by a shock wave to travel this distance is 0.3ms. If the velocity of second is 340m/s under the same condition , find the Mach number of the shock wave. **(04 Marks)**

OR

2 a. What is Mach Number? Classify shock waves on the basis of Mach number and mention examples for each. **(06 Marks)**

b. Derive the expression for equivalent force constant for two springs in series and parallel. What is the period of its oscillations? **(10 Marks)**

c. A 20g oscillator with natural frequency 10 rad/s is vibrating in damping medium. The damping force is proportional to the velocity of the vibrator. If the damping coefficient is 0.17, how does the oscillations decays. **(04 Marks)**

Module-2

3 a. Explain stress and strain diagram. **(06 Marks)**

b. Derive an expression for couple per unit twist of a solid cylinder. **(10 Marks)**

c. A load of 2kg produces an extension of 1mm in a wire of 3m in length and 1mm in diameter. Calculate the Young's modulus of the wire. **(04 Marks)**

OR

4 a. Show that shear strain (θ) is equivalent to half of compression strain ($\theta/2$) and half of extension strain ($\theta/2$) in two mutually perpendicular directions. **(06 Marks)**

b. Derive an expression for Young's modulus (Y) using Single Cantilever method. **(10 Marks)**

c. Calculate the torque produced in a wire of length 1.5m, radius 0.0425×10^{-2}m through an angle of ($\pi/45$) radians. If the rigidity modulus of the material is $8.3 \times 10^{+10}$ N/m^2. **(04 Marks)**

Module-3

5 a. By using Maxwells equations develop wave equation for electric and magnetic fields in free space. **(10 Marks)**

b. Explain with neat diagram the different types of optical fibre. **(06 Marks)**

c. An optical fibre has core RI 1.5 and RI of cladding is 1.455. Calculate numerical aperture and angle of acceptance. **(04 Marks)**

OR

6 a. Obtain the expression for Numerical Aperture and angle of acceptance and hence show the condition for propagation. **(08 Marks)**

b. State and prove Gauss divergence theorem. **(08 Marks)**

c. Find attenuation in an optical fibre of length 500m when a length of power 100mw emerges out of the fiber with a power 90mw. **(04 Marks)**

Module-4

7 a. State Heisenberg's uncertainty principle. Show that electron do not exists inside the nucleus using it. **(08 Marks)**

b. With neat diagram, explain the construction and working of CO_2 laser. **(08 Marks)**

c. An electron is trapped in a one – dimensional potential well of infinite height and a width of 0.2nm. Calculate the energy required for ground state and its first two excited states. **(04 Marks)**

OR

8 a. Derive an expression for energy density in terms of Einsteins co-efficients. **(10 Marks)**

b. Obtain energy eigen values for a particle in a potential well of infinite height. **(06 Marks)**

c. The uncertainty in the measurement of time spent by Iridium – 199 nuclei in the excited state is found to be 1.4×10^{-10} sec. Estimate the uncertainty in energy in the excited state. **(04 Marks)**

Module-5

9 a. Explain Hall effect. Derive an expression for Hall voltage, Hall field and Hall co-efficient. **(10 Marks)**

b. Define Fermi factor. Explain the variation of Fermi factor with temperature. **(06 Marks)**

c. The intrinsic carrier concentration of Germanium is $2.4 \times 10^{19}/m^3$. Calculate its conductivity if the mobility of the electron and holes respectively are $0.39 m^2/VS$ and $0.19 m^2/V\text{-}S$. **(04 Marks)**

OR

10 a. Derive Clausius – Morsotti relation in a solid dielectric. **(08 Marks)**

b. Explain any two failures of classical free electron theory and any two merits of quantum free electron theory. **(08 Marks)**

c. Calculate the concentration at which donor atoms need to be added to a silicon semiconductor, so that it results in n-type semi conductivity of 2.2×10^{-4} S/m and the mobility of electron being $1.25 \times 10^{-3} m^2/VS$. **(04 Marks)**

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18CHE12/22

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
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 reduction potential and derive Nernst equation for single electrode potential. **(06 Marks)**

b. What is a Reference electrode? Explain the construction and working of a Calomel electrode. **(07 Marks)**

c. Define Cell Potential. Give the cell representation , cell reactions and calculate the potential of the cell consists of Li and Cu electrodes dipped in 0.1 M Li Cℓ and 0.5M $CuSO_4$ solutions at 25^0C. Given E^0Li = -3.05V and E^0Cu = 0.34V. **(07 Marks)**

OR

2 a. Define Ion selective electrode. Explain the determination of pH using glass electrode. **(06 Marks)**

b. Derive an equation for potential of a concentration cell and calculate the potential of following cell at 25^0C. Ag/Ag NO_3 (0.005m) // Ag NO_3(0.5m)/Ag. **(07 Marks)**

c. Explain the construction and working of Li - ion cells. Mention its applications. **(07 Marks)**

Module-2

3 a. Briefly explain the effect of following factors on rate of corrosion :
i) The ratio of Anodic and Cathodic areas ii) Nature of corrosion product.
iii) pH of the medium. **(06 Marks)**

b. Define Corrosion of metals. Describe the electrochemical theory of rusting of iron. **(07 Marks)**

c. Define Electroless plating and explain electroless plating of copper. **(07 Marks)**

OR

4 a. Explain Electroplating of hard chromium and mention its applications. **(06 Marks)**

b. Discuss the following : i) Differential metal corrosion ii) Anodization of aluminum. **(07 Marks)**

c. Explain in brief : i) Sacrificial anode method ii) Decomposition potential. **(07 Marks)**

Module-3

5 a. Define Calorific value of a fuel and calculate the gross and net calorific value of a coal from the following data :
i) Mass of coal burnt = 0.85 gms.
ii) Water equivalent mass of copper calorimeter = 0.65kg.
iii) Mass of water taken in the copper calorimeter = 2.2kg.
iv) Rise in temperature of water = 3.0^0C.
v) Percentage of H_2 in the coal = 3.2.
vi) Latent heat of steam = 2457.76 kJ/kg. **(06 Marks)**

b. Define Fuel cell and explain the construction and working $CH_3OH - O_2$ fuel cell. **(07 Marks)**

c. Describe the preparation of solar grade silicon by Union carbide process. **(07 Marks)**

OR

6 a. Explain the experimental determination of calorific value of a fuel using bomb calorimeter. **(07 Marks)**

b. What are Solar cells? Explain the construction and working of a Photo voltaic cell. **(06 Marks)**

c. Discuss : i) Knocking of petrol engine ii) Power alcohol. **(07 Marks)**

Module-4

7 a. Discuss the sources , effects and control measures of oxides of nitrogen. **(06 Marks)**

b. Explain the causes, effects and disposal methods of biomedical wastes. **(07 Marks)**

c. Explain Scale and Sludge formation in boilers. **(07 Marks)**

OR

8 a. Define BOD and COD. Calculate the COD of a wastewater if 25mℓ of which consumes 10.5mℓ of 0.02N $K_2Cr_2O_7$ for complete oxidation. **(06 Marks)**

b. Explain the softening of water by ion exchange method. **(07 Marks)**

c. Explain the following : i) Ozone depletions ii) Reverse osmosis. **(07 Marks)**

Module-5

9 a. Explain the theory and instrumentation of colorimetry. **(07 Marks)**

b. Discuss the theory of conductometric titration and explain the nature of graph for the following titrations :

i) Strong acid with strong base ii) Weak acid with strong base. **(07 Marks)**

c. Explain the synthesis of nanomaterials by Chemical Vapour Deposition method. **(06 Marks)**

OR

10 a. Explain Sol – gel method of synthesis of nanomaterials. **(06 Marks)**

b. Write a note on synthesis , properties and uses of Fullerenes. **(07 Marks)**

c. Explain 'Atomic Absorption Spectroscopy'. **(07 Marks)**

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18CPS13/23

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
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. Define Computer. Explain the generations of computer. **(08 Marks)**

b. List the input devices of computer and explain any two input devices. **(06 Marks)**

c. Define Algorithm. Write an algorithm to find the area and perimeter of a rectangle. **(06 Marks)**

OR

2 a. Explain the basic structure of C program, with an example. **(08 Marks)**

b. What is an Operator? List and explain any 4 types of operator. **(08 Marks)**

c. Evaluate the following expressions :

i) 100% 20 < = 20 – 5 + 100% 10 – 20 = = 5 > = 1! = 20.

ii) a + = b * = c - =5 , where a = 3 , b = 5 and c = 8. **(04 Marks)**

Module-2

3 a. Explain formatted input output functions in C with examples. **(06 Marks)**

b. What are different types of conditional statements? Explain if, if else and nested if with syntax and examples. **(08 Marks)**

c. Write a C program to find the sum of natural numbers from 1 to N using while loop. **(06 Marks)**

OR

4 a. List the differences between while and do – while loop along with syntax and example. **(06 Marks)**

b. Write a C program to find all possible roots of quadratic equation and print them with appropriate messages. **(08 Marks)**

c. Explain break and continue statements with example. **(06 Marks)**

Module-3

5 a. What is an array? Write syntax for declaring two dimensional array and initialize the same with suitable examples. **(08 Marks)**

b. Write a C program to find biggest of n numbers using arrays. **(06 Marks)**

c. List the differences between Linear and binary search. **(06 Marks)**

OR

6 a. Explain any 4 string manipulation library functions with examples. **(08 Marks)**

b. Write a C program to find transpose of a given matrix. **(06 Marks)**

c. Write an algorithm for linear search. **(06 Marks)**

Module-4

7 a. Define Function. What are the advantages of user defined functions? **(06 Marks)**

b. Explain types of functions based on parameters. **(08 Marks)**

c. Define Recursion. Write a C program to find factorial of a number using recursion. **(06 Marks)**

OR

8 a. Define the following :
i) Actual parameter ii) Formal parameter
iii) Global variable iv) Local variable. **(06 Marks)**

b. Write a C function isprime (num) that accepts an integer argument and returns 1 if the argument is prime, 0 otherwise. Write a C program that invokes this function to generate prime numbers between given range. **(08 Marks)**

c. Write a C program to generate Fibonacci series using recursive function. **(06 Marks)**

Module-5

9 a. What is a Structure? Explain structure with syntax and example. **(08 Marks)**

b. Differentiate between Structures and Unions. **(04 Marks)**

c. Write a C program to maintain record of n students using structures with 4 fields (Rollno, marks, name and grade). Print the names of students with marks > = 70. **(08 Marks)**

OR

10 a. What is a Pointer? Explain how pointer variable is declared and initialized. **(06 Marks)**

b. What is Preprocessor directive? Explain #define and #include preprocessor directive. **(06 Marks)**

c. Explain call by value and call by reference with functions. **(08 Marks)**

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18ELE13/23

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
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 and explain Ohm's law. List out its limitations. **(06 Marks)**

b. For the figure shown in Fig.Q1(b), calculate the current in 2Ω resistor.

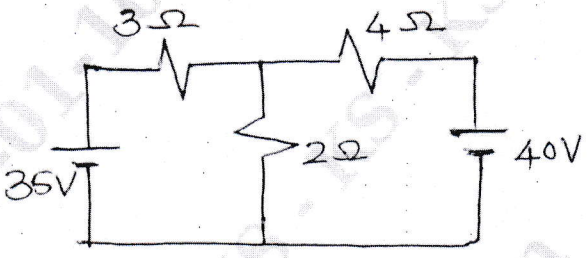

Fig.Q1(b) **(06 Marks)**

c. For the current wave, $e = 140 \sin 314t$. Find:

(i) Peak current (ii) Average value (iii) Frequency
(iv) Time period (v) RMS value (vi) Instantaneous value at t = 3 ms
(vii) Form of factor (viii) Peak factor **(08 Marks)**

OR

2 a. State and explain Kirchoff's laws, as applied to D.C. circuit. **(06 Marks)**

b. Using series-parallel reduction, calculate the current supplied by the source for the circuit shown in Fig.Q2(b).

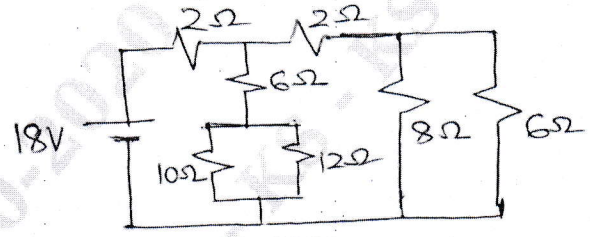

Fig.Q2(b) **(08 Marks)**

c. Derive the expression for RMS value of alternating quantity. **(06 Marks)**

Module-2

3 a. Show that power consumed by pure capacitor is zero. Draw the voltage, current and power waveform. **(07 Marks)**

b. Mention the advantages of 3-phase system over 1-phase system. **(05 Marks)**

c. A circuit consists of non-inductive resistance of 10Ω and inductance of 16 mH and a capacitance of 150 μF all connected in series. A supply of 100 V, 50 Hz is applied to the circuit. Find the current power factor and power consumed by the circuit. **(08 Marks)**

OR

4 a. Show that two wattmeters are sufficient to measure three phase power for a balanced star connected load. **(06 Marks)**

b. Derive an expression for impedance, phase angle and power for series R-L circuit supplied with AC. **(06 Marks)**

c. How is current 10A shared by three impedance $Z_1 = 2 - j5\,\Omega$, $Z_2 = 6.708\angle 26.56\,\Omega$, $Z_3 = 3 + j4\,\Omega$ all are connected in parallel? **(08 Marks)**

Module-3

5 a. State the principle of operation of transformer. Derive an expression for emf induced in transformer. **(06 Marks)**

b. Explain the operation of 3-way control of lamp with the help of diagram and functional table. **(06 Marks)**

c. Maximum efficiency at full load and unity power factor of a 1-phase, 25 kVA, 500/1000 V, 50 Hz transformer is 98%. Calculate its efficiency at: (i) 75% of full load, 0.9 p.f. (ii) 50% of full load, 0.8 p.f. (iii) 25% of full load, 0.6 p.f. **(08 Marks)**

OR

6 a. Briefly explain (i) Concealed wiring (ii) Service mains **(06 Marks)**

b. Write short notes on: (i) Fuse (ii) MCB **(06 Marks)**

c. A transformer working at unity power factor has an efficiency of 90% at both half load and at full load of 500 W. Determine the efficiency at 75% of full load. **(08 Marks)**

Module-4

7 a. With a neat diagram, explain the constructional details of DC Generator. **(06 Marks)**

b. Derive an equation of torque of DC motor. **(06 Marks)**

c. A 4-pole lap wound shunt generator delivers 200 A at terminal voltage of 250 V. It has field and armature resistance 50 Ω and 0.05 Ω respectively. Neglect brush drop. Calculate:
(i) Armature current (ii) Current per parallel path
(iii) emf generated (iv) Power developed **(08 Marks)**

OR

8 a. Explain the significance of back emf in DC motor. **(04 Marks)**

b. Derive an emf equation of DC generator. **(06 Marks)**

c. A 250 V DC shunt motor takes 6A line current on no load and runs at 1000 rpm. The field resistance is 250 Ω and armature resistance is 0.2 Ω. If the full load line current is 26A, calculate full load speed assuming constant air gap flux. **(10 Marks)**

Module-5

9 a. With neat sketch, explain the constructional details of 3-phase alternator. **(06 Marks)**

b. Explain the operating principle of three phase induction motor. **(06 Marks)**

c. A 6-pole, 3-phase star connected alternator has 90 slots and 8 conductors per slot and rotates at 1000 rpm. The flux per pole is 50 mWb. Find the induced emf across its lines. Assume winding factors of 0.97. **(08 Marks)**

OR

10 a. Explain the constructional details of 3-phase induction motor. Draw relevant sketches. **(08 Marks)**

b. Derive an expression for frequency of induced emf in case of 3-phase alternator. **(04 Marks)**

c. A 3-phase induction motor with 4-poles is supplied from an alternator having 6-poles and running at 1000 rpm. Calculate:
(i) Synchronous speed of induction motor (ii) Its speed when slip is 0.04
(iii) Frequency of rotor emf when speed is 600 rpm **(08 Marks)**

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18ELN14/24

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
Basic Electronics

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 operation of PN – junction diode under forward and reverse bias condition. **(08 Marks)**

b. Explain how zener diode can be used as voltage regulator. **(06 Marks)**

c. A silicon diode has I_S = 10nA, operating at 25°C. Calculate diode current I_D for a forward bias of 0.6V. **(06 Marks)**

OR

2 a. With neat circuit diagram, explain the operation of center tapped full wave rectifier. Draw input and output waveforms. **(08 Marks)**

b. Explain photo diode and LED in brief. **(06 Marks)**

c. Explain LM7805 fixed voltage regulator. **(06 Marks)**

Module-2

3 a. Explain construction and operation of n–channel JFET. Draw transfer and drain characteristic. **(08 Marks)**

b. Explain the operation of CMOS inverter. **(06 Marks)**

c. A n–channel JFET has I_{Dss} = 8mA, V_p = –4V. Determine I_D for V_{GS} = –1V and V_{GS} = –2V. **(06 Marks)**

OR

4 a. Explain construction and operation of n – channel depletion MOSFET. **(08 Marks)**

b. Explain the operation of SCR using 2 – Transistor model. **(06 Marks)**

c. Explain natural and forced commutation turn off methods of SCR. **(06 Marks)**

Module-3

5 a. Define following terms with respect to OP –Amp : i) CMRR ii) Input offset voltage iii) Slew rate. Also mention op-amp ideal characteristics. **(08 Marks)**

b. A certain op-amp has an open loop differentials voltage gain of 1,00,000 and CMRR = 4,00,000. Determine common mode gain and express CMRR in decibels. **(06 Marks)**

c. Explain op-amp as integrator. **(06 Marks)**

OR

6 a. With neat circuit, explain the operation of three input adder circuit. Derive expression for V_0. **(08 Marks)**

b. A non inverting amplifier has closed loop gain of 25. If input voltage V_i = 10mv, R_f = 10KΩ determine the value of R_1 and output voltage V_0. **(06 Marks)**

c. Explain difference amplifier using op-amp. **(06 Marks)**

Module-4

7 a. With neat circuit, explain transistor as an amplifier. Derive expression for voltage gain. **(08 Marks)**

b. Mention types of feedback amplifier. With block diagram, explain voltage series feedback amplifier. **(06 Marks)**

c. A negative feedback amplifier has gain A = 1000 and bandwidth of 200KHz. Calculate gain and bandwidth with feedback if feedback factor $\beta = 20\%$. **(06 Marks)**

OR

8 a. What is phase shift oscillator? Explain with circuit, RC phase shift oscillator. **(08 Marks)**

b. Explain with circuit, Astable multivibrator using IC 555. **(06 Marks)**

c. An Astable multivibrator circuit has $R_1 = 6.8K\Omega$, $R_2 = 4.7K\Omega$, $C = 0.1\mu F$. Calculate frequency of oscillation and duty cycle. **(06 Marks)**

Module-5

9 a. Convert :

i) $(2467.125)_{10} = (?)_2 = (?)_{16}$

ii) $(765.16)_8 = (?)_{10} = (?)_2$

iii) $(101111.101)_2 = (?)_8 = (?)_{10}$. **(08 Marks)**

b. Explain full adder using truth table and expression. Implement sum and carry expressions. **(06 Marks)**

c. Implement half adder using NAND gates. **(06 Marks)**

OR

10 a. State and prove De–Morgan's theorems for two variables. **(08 Marks)**

b. With the help of logic diagram and truth table, explain the working of clocked SR – Flip flop. **(06 Marks)**

c. Explain the basic block diagram of communication system. **(06 Marks)**

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CBCS SCHEME

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18CIV14/24

First/Second Semester B.E. Degree Examination, Aug./Sept.2020
Element of Civil Engineering and Mechanics

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Missing data, if any, may be suitably assumed.

Module-1

1 a. Explain Briefly the scope of :
i) Construction Technology
ii) Environmental Engineering. **(08 Marks)**

b. Explain the role of civil engineer in the infrastructure development of the country. **(08 Marks)**

c. State and explain the low of transmissibility of forces. **(04 Marks)**

OR

2 a. State and prove Varignon's theorem of moments. **(08 Marks)**

b. Replace the horizontal force acting at A by an equivalent force acting at a B and a couple. Refer Fig.Q2(b).

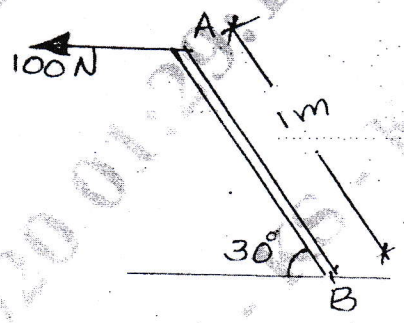

Fig.Q2(b) **(05 Marks)**

c. For the non-concurrent coplanar system shown in Fig.Q2(c), determine the magnitude, direction and position of the resultant force with reference to A.

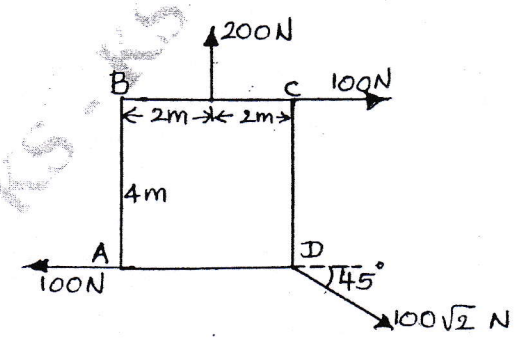

Fig.Q2(c) **(07 Marks)**

Module-2

3 a. State and prove Lami's theorem. **(04 Marks)**

b. Two identical rollers each weighing 200N are placed in a trough as shown in Fig.Q3(b), Assuming all contact surfaces to be smooth, find the reactions development at contact surfaces A, B, C and D.

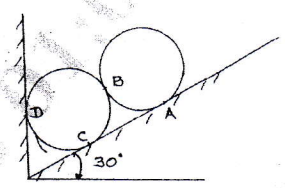

Fig.Q3(b) **(08 Marks)**

c. A string is subjected to the forces 4 kN and P as shown in Fig.Q3(c). Determine the magnitude of P and tension forces induced in various portions of the string.

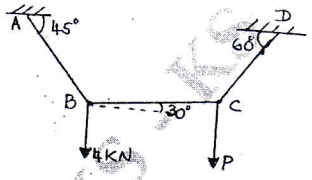

Fig.Q3(c) **(08 Marks)**

OR

4 a. State the laws of dry friction. **(04 Marks)**

b. A block of weight 1000N is resting on an inclined plane as shown in Fig.4(b). Find the magnitude of the horizontal force P to cause impending motion of the block :
i) Up the plane ii) Down the plane. Assume coefficient of friction = 0.25.

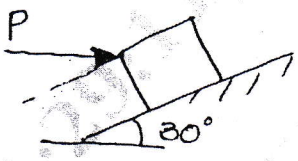

Fig.Q4(b) **(08 Marks)**

c. A ladder of length 5m and weighing 300N is placed against a vertical wall at an angle 60° with respect to the floor. The coefficient of friction between the wall and the ladder is 0.2 and that between the floor and the ladder 0.3. Calculate the minimum force (horizontal) P to be applied at the lower end of the ladder to prevent slipping when a man weighing 600N stands at a distance of 3m along the ladder from the bottom end. **(08 Marks)**

Module-3

5 a. Describe different types of supports with neat sketches showing the reactions. **(08 Marks)**

b. Find the support reactions for the beam shown in Fig.Q5(b).

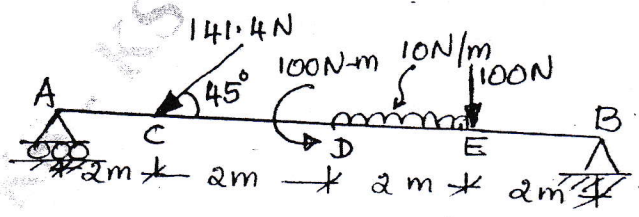

Fig.Q5(b) **(08 Marks)**

c. Find the reactions for the cantilever beam shown in Fig.Q5(c).

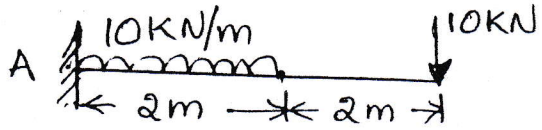

Fig.Q5(c)

OR

6 a. Explain different types of trusses. **(06 Marks)**

b. Find the support reactions and member forces for the plane truss shown in Fig.6(b) by method of joints.

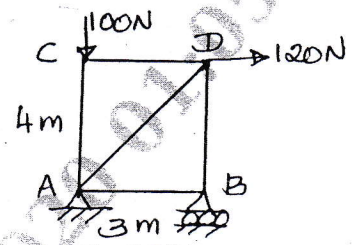

Fig.Q6(b) **(14 Marks)**

Module-4

7 a. Derive the centroid of a triangle from first principle. **(08 Marks)**

b. Locate the centroid of the shaded area with respect to the coordinate axes shown in Fig.Q7(b).

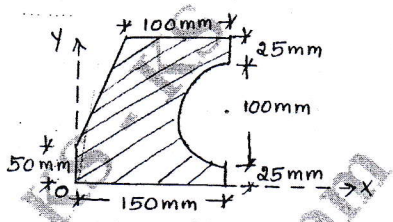

Fig.Q7(b) **(12 Marks)**

OR

8 a. State and prove parallel axis theorem. **(08 Marks)**

b. Find the polar moment of inertia for the section in Fig.Q8(b) and hence find the polar radius of gyration.

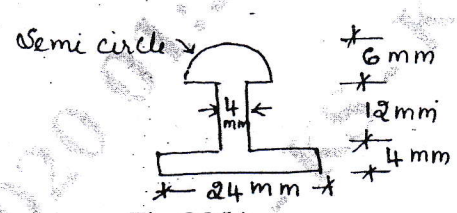

Fig.Q8(b) **(12 Marks)**

Module-5

9 a. State Newton's laws of motion. **(06 Marks)**

b. A car travels along a straight line on road. Its distance is given by the equation $S = 2.4t^2 - 0.12t^3$ where t is the time in seconds.

i) Calculate the average velocity of the car for the time interval at t = 0 and t = 15 sec.

ii) Calculate the instantaneous velocity of the car at t = 5sec

iii) Calculate the instantaneous acceleration of the car at t = 5 sec. **(14 Marks)**

OR

10 a. State D'Alembert's principle and its applications. **(04 Marks)**

b. Define : i) Super elevation ii) Trajectory. **(04 Marks)**

c. A ball is dropped from the top of a tower 30m high. At the same instant another ball is thrown upward from the ground with an initial velocity of 15m/s. When and where do they cross? **(12 Marks)**

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CBCS SCHEME

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18ME15/25

First/Second Semester B.E. Degree Examination, Aug./Sept.2020

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. Differentiate renewable energy sources with non-renewable sources. **(04 Marks)**
b. Briefly explain Global Warming and Ozone depletion. **(08 Marks)**
c. Define Zeroth, 1st law, 2nd law and 3rd law of thermodynamics. **(08 Marks)**

OR

2 a. Define:
(i) Internal energy
(ii) Enthalpy
(iii) Entropy **(06 Marks)**
b. Explain the formation of steam. **(06 Marks)**
c. Explain briefly the application of hydel, wind, nuclear and bio-fuels. **(08 Marks)**

Module-2

3 a. Explain the working of Lancashire boiler with neat sketch. **(10 Marks)**
b. With neat sketch, explain working of Francis turbine. **(10 Marks)**

OR

4 a. List and explain functions of any four boiler mountings. **(06 Marks)**
b. Explain the working of centrifugal pump with neat sketch. **(08 Marks)**
c. Explain the phenomenon of priming and cavitation in pump. **(06 Marks)**

Module-3

5 a. Explain the working of four-stroke diesel engine with neat sketch. **(10 Marks)**
b. A single cylinder two stroke petrol engine develops 7.5 KW at 2500 rpm. The mean effective pressure on the piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke length of the cylinder if stroke to bore ratio is 1.5, also calculate the fuel consumption rate if the brake thermal efficiency is 28%. The calorifical value of the fuel used is 43,900 kJ/kg. **(10 Marks)**

OR

6 a. Define:
(i) Refrigerating effect
(ii) Tonn of refrigeration
(iii) Ice making capacity
(iv) Coefficient of performance
(v) Unit of refrigeration **(10 Marks)**
b. With a neat sketch, explain the working of vapour compression refrigeration. **(10 Marks)**

Module-4

7 a. Write short note on smart materials and shape memory alloys. (08 Marks)
b. Explain with neat sketch the oxy-acetylene gas welding. (08 Marks)
c. Explain briefly thermoplastics and thermosetting polymers. (04 Marks)

OR

8 a. Define velocity ratio of belts. Derive the length of the belt in open drive. (10 Marks)
b. List the advantages of V-belts over flat belts. (04 Marks)
c. Explain spur, helical and bevel gears. (06 Marks)

Module-5

9 a. Explain the following lathe operations:
(i) Turning
(ii) Facing
(iii) Knurling
(iv) Drilling (10 Marks)
b. Explain the following milling operations:
(i) Plane milling
(ii) End milling
(iii) Slot milling
(iv) Gang milling (10 Marks)

OR

10 a. With a neat sketch, explain components of CNC system. (08 Marks)
b. List the advantages of CNC machines. (04 Marks)
c. Explain the application of Robots in material handling and assembly. (08 Marks)

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