CBCS SCHEME

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17MAT11

First Semester B.E. Degree Examination, June/July 2019
Engineering Mathematics – I

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 n^{th} derivative of $\sin 2x \sin 3x$. **(06 Marks)**

b. Find the angle between the two curves $r = \frac{a}{1+\cos\theta}$ and $r = \frac{b}{1-\cos\theta}$ **(07 Marks)**

c. Find the radius of curvature for the curve $x^3 + y^3 = 3xy$ at (3/2, 3/2). **(07 Marks)**

OR

2 a. If $y = \cos(m \log x)$ then prove that $x^2 y_{n+2} + (2n+1)x y_{n+1} + (m^2 + n^2) y_n = 0$. **(06 Marks)**

b. With usual notation prove that $\tan\phi = r\frac{d\theta}{dr}$. **(07 Marks)**

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

Module-2

3 a. Find the Taylor's series of $\log(\cos x)$ in powers of $(x - \pi/3)$ upto fourth degrees terms. **(06 Marks)**

b. If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x + y}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$ by using Euler's theorem. **(07 Marks)**

c. If $u = \frac{yz}{x}, v = \frac{xz}{y}, w = \frac{xy}{z}$ then find $J = \frac{\partial(uvw)}{\partial(xyz)}$. **(07 Marks)**

OR

4 a. Evaluate $\lim_{x \to 0}\left(\frac{\tan x}{x}\right)^{1/x^2}$. **(06 Marks)**

b. Using Maclaurin's series, prove that $\sqrt{1+\sin 2x} = 1 + x - \frac{x^2}{\lfloor 2} - \frac{x^3}{\lfloor 3} + \frac{x^4}{\lfloor 4} - + - - - -$. **(07 Marks)**

c. If $u = f(2x - 3y, 3y - 4z, 4z - 2x)$ then prove that $\frac{1}{2}\frac{\partial u}{\partial x} + \frac{1}{3}\frac{\partial u}{\partial y} + \frac{1}{4}\frac{\partial u}{\partial z} = 0$. **(07 Marks)**

Module-3

5 a. A particle moves along the cuvre $\vec{r} = (t^3 - 4t)\hat{i} + (t^2 + 4t)\hat{j} + (8t^2 - 3t^3)\hat{k}$. Find the components of velocity and acceleration in the direction of $\hat{i} - 3\hat{j} + 2\hat{k}$ at $t = 0$. **(06 Marks)**

b. Find the constant a and b such that $\vec{F} = (axy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (bxz^2 - y)\hat{k}$ is irrotational and find scalar potential function ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

c. Prove that $\text{curl}(\phi\vec{A}) = \phi\,\text{curl}\,\vec{A} + \text{grad}\phi \times \vec{A}$. **(07 Marks)**

OR

6 a. Show that vector field $F = \frac{x\hat{i} + y\hat{j}}{x^2 + y^2}$ is both solenoidal and irrotational. **(06 Marks)**

b. If $\vec{F} = (x + y + 1)\vec{i} + \vec{j} - (x + y)\vec{k}$ then prove that $\vec{F} \cdot \text{curl}\,\vec{F} = 0$. **(07 Marks)**

c. Show that $\text{div}(\text{curl}\,\vec{A}) = 0$. **(07 Marks)**

Module-4

7 a. Obtain reduction formula for $\int \sin^n x\,dx (n > 0)$. **(06 Marks)**

b. Solve the differential equation $\frac{dy}{dx} + y\cot x = \cos x$. **(07 Marks)**

c. Find the orthogonal trajectory of the curve $r = a(1 + \sin\theta)$. **(07 Marks)**

OR

8 a. Evaluate $\int_0^{\pi/2} \sin^7\theta \cos^6\theta\,d\theta$. **(06 Marks)**

b. Solve the differential equation : $(2xy + y - \tan y)dx + (x^2 - x\tan^2 y + \sec^2 y)dy = 0$. **(07 Marks)**

c. If the temperature of air is 30°C and the substance cools from 100°C to 70°C in 15 mins. Find when the temperature will be 40°C. **(07 Marks)**

Module-5

9 a. Find the rank of the matrix $\begin{bmatrix} 1 & 1 & 1 & 6 \\ 1 & -1 & 2 & 5 \\ 3 & 1 & 1 & 8 \\ 2 & -2 & 3 & 7 \end{bmatrix}$ by reducing to Echelon form. **(06 Marks)**

b. Find the largest eigen value and egien vector of the matrix : $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ by taking initial vector as $[1\ 1\ 1]^T$ by using Rayleigh's power method. Carry out five iteration. **(07 Marks)**

c. Reduce $8x^2 + 7y^2 + 3z^2 - 12xy + 4xz - 8yz$ into canonical form, using orthogonal transformation. **(07 Marks)**

OR

10 a. Solve the system of equations

$10x + y + z = 12$

$x + 10y + z = 12$

$x + y + 10z = 12$

by using Gauss-Seidel method. Carry out three iterations. **(06 Marks)**

b. Diagonalise the matrix $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$. **(07 Marks)**

c. Show that the transformation

$y_1 = x_1 + 2x_2 + 5x_3$

$y_2 = 2x_1 + 4x_2 + 11x_3$

$y_3 = -x_2 + 2x_3$

is regular. Write down inverse transformation. **(07 Marks)**

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17CHE12/22

First/Second Semester B.E. Degree Examination, June/July 2019
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? Obtain an expression for the same. **(07 Marks)**

b. What are reference electrodes? Explain the construction and working of Calomel electrode. **(07 Marks)**

c. Write a note on following battery characteristics:
(i) Capacity (ii) Current (iii) Shelf life **(06 Marks)**

OR

2 a. What are batteries? Explain the construction and working of Li-MnO_2 battery. Mention its applications. **(07 Marks)**

b. Explain the construction and application of CH_3OH-O_2 fuel cell. Mention its applications. **(07 Marks)**

c. The cell potential of Cu concentration cell Cu | Cu^{2+}(0.0093 M) | | $CuSO_4$(X) | Cu is 0.086 V at 25°C. Write cell reaction and calculate the value of 'X'. **(06 Marks)**

Module-2

3 a. What is corrosion? Explain the resting of Iron by using electrochemical theory. **(07 Marks)**

b. What is cathodic protection? Explain sacrificial anodic method and impressed current method. **(07 Marks)**

c. What is metal finishing? Explain the following :
(i) Polarization (ii) Over voltage. **(06 Marks)**

OR

4 a. Discuss the effect of following on nature of electrodeposit:
(i) Current density (ii) pH (iii) Temperature. **(07 Marks)**

b. Explain the electroplating of Nickel. **(07 Marks)**

c. Write a note on the following :
(i) Galvanic corrosion (ii) Concentration cell corrosion (water line and pitting). **(06 Marks)**

Module-3

5 a. What is calorific value? Explain the experimental determination of calorific value of fuel by using Bomb calorimeter. **(07 Marks)**

b. Calculate the gross and net calorific value of a coal sample from the following data obtained from Bomb-calorimeter experiment:
(i) Weight of coal = 0.73 g, (ii) Weight of water taken in calorimeter = 1500 g. (iii) Water equivalent of calorimeter = 470 g (iv) Initial temperature = 25.0°C (v) Final temperature = 27.3°C (vi) % of H_2 in coal = 2.5% (vii) Latent heat of steam = 587 cal g^{-1}. **(07 Marks)**

c. Explain the production of solar grade Si by union carbide process. **(06 Marks)**

OR

6 a. Explain the construction and working of typical P.V. cell. **(07 Marks)**

b. What are solar cells? Explain the modules panels and arrays. **(07 Marks)**

c. Explain the fluidized bed catalytic cracking process. **(06 Marks)**

Module-4

7 a. What are polymers? Explain the addition polymerization mechanism by taking Vinyl Chloride as example **(07 Marks)**

b. What is glass transition temperature? Explain the factors affecting T_g value. **(07 Marks)**

c. Explain the synthesis of

(i) Plexi glass (ii) Epoxy resin. **(06 Marks)**

OR

8 a. What are elastomers? Explain the synthesis and applications of Silicone rubbers. **(07 Marks)**

b. What are conductivity polymers? Write the mechanism of polyaniline. **(07 Marks)**

c. Calculate the $\bar{\mu}_n$ and $\bar{\mu}_w$ for a polymer sample consisting of 10% by weight of macromolecules of molecular weight 10,000 and 90% by weight of molecules with molecular weight 100000. $M_1 = 10$, $M_2 = 90$. **(06 Marks)**

Module-5

9 a. What is boiler feed water? Explain the scale and sludge formation in boiler. **(07 Marks)**

b. 25 ml of waste water was mixed with 10 ml of $K_2Cr_2O_7$, acidified and refluxed. The unreacted $K_2Cr_2O_7$ acidified required 15.2 ml of 0.3N FAS. In blank titration 10ml of $K_2Cr_2O_7$ acidified required 19.4 ml of same 0.3N FAS. Calculate COD of waste water. **(07 Marks)**

c. Write a note on Fullerenes. Mention its applications. **(06 Marks)**

OR

10 a. What are nano materials? Explain the synthesis of nanomaterials by Sol-gel method. **(07 Marks)**

b. Write note on the following :

(i) Carbon nanotubes (ii) Dendrimers **(06 Marks)**

c. What is desalination? Explain desalination of water by electrodialysis. **(07 Marks)**

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17PHY12/22

First/Second Semester B.E. Degree Examination, June/July 2019
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 : Velocity of light, $c = 3 \times 10^8$ ms^{-1}
Mass of electron, $m_o = 9.1 \times 10^{-31}$kg
Boltzmann constant, $K_B = 1.38 \times 10^{-23}$J/k
Charge of an electron, $e = 1.6 \times 10^{-19}$C
Avagadro number, $N_A = 6.02 \times 10^{26}$/k mole

Module-1

1 a. What is ultraviolet catastrophe? Discuss in brief Wien's law and Rayleigh-Jeans law to explain blackbody radiation. **(06 Marks)**

b. Solve the Schrodinger's wave equation for the allowed energy values in the case of particle in a box and also find eigen function for the same and represent with figure. **(10 Marks)**

c. Calculate the wavelength associated with an electron having a kinetic energy of 100 eV. **(04 Marks)**

OR

2 a. Define group velocity and phase velocity. Derive the relation between the two. **(06 Marks)**

b. Mention the properties of the wave function. Set up time-independent one-dimensional Schrodinger's equation. **(10 Marks)**

c. In a measurement that involved a maximum uncertainty of 0.003%, the speed of an electron was found to be 800 ms^{-1}. Calculate the corresponding uncertainty involved in determining its position. **(04 Marks)**

Module-2

3 a. Define the following terms: (i) Drift velocity (ii) Relaxation time. Discuss the drawbacks of classical free electron theory in metals. **(08 Marks)**

b. Define critical magnetic field. Explain types of super conductors. Mention applications of super conductors. **(08 Marks)**

c. The effective mass of an electron in Silicon (Si) is 0.31 m_o, where m_o is free electron mass. Find the electron concentration for Si at 300 K, assuming that Fermi level lies exactly in the middle of energy gap. Given energy gap of Si = 1.1 eV. **(04 Marks)**

OR

4 a. Briefly explain Fermi-Dirac statistics and discuss the dependence of Fermi-factor on temperature. **(06 Marks)**

b. State and explain Meissner effect. **(05 Marks)**

c. Explain BCS theory for superconductivity. **(05 Marks)**

d. The resistivity of intrinsic Silicon at 27°C is 3000 Ωm. Assuming electron and hole mobilities of 0.17 m^{2}V^{-1}S^{-1} and 0.035 m^{2}V^{-1}S^{-1} respectively. Calculate intrinsic carrier concentration. **(04 Marks)**

Module-3

5 a. Explain construction and working of semiconductor laser with the help of energy band diagram. **(07 Marks)**

b. Describe recording and reconstruction process in holography with the help of suitable diagram. Mention its applications. **(09 Marks)**

c. A medium in thermal equilibrium at temperature 300K has two energy levels with a wavelength separation of 1 μm. Find the ratio of population densities of the upper and lower levels. **(04 Marks)**

OR

6 a. Obtain an expression for energy density of radiation under equilibrium condition in term of Einstein's coefficients. **(06 Marks)**

b. Discuss types of optical fibers using suitable diagrams. **(06 Marks)**

c. Explain point to point communication system using optical fiber with block diagram. **(04 Marks)**

d. The attenuation of light in an optical fibre is estimated as 2.2 dB/km. What fractional initial intensity remains after 2 km and 6 km? **(04 Marks)**

Module-4

7 a. What are Miller Indices? Show that for cubic the distance between two successive plane $(h\ k\ \ell)$ is given by $d = \frac{a}{\sqrt{h^2 + k^2 + \ell^2}}$. **(07 Marks)**

b. Define coordination number, atomic radius and atomic packing factor. Find atomic packing factor for SC, BCC and FCC. **(09 Marks)**

c. X-rays of wavelength 1.541 Å are diffracted by (1 1 1) planes in a crystal at an angle of 30° in the first order. Calculate the inter atomic spacing. **(04 Marks)**

OR

8 a. Explain the procedure followed to specify crystal planes using Miller indices with an example. **(05 Marks)**

b. State and explain Bragg's law. Describe how Bragg's spectrometer is used to determine the wavelength of an x-ray beam. **(10 Marks)**

c. Draw following planes in cubic unit cell (100) (110) (011) (111) (001). **(05 Marks)**

Module-5

9 a. Explain the construction and working of scanning electron microscope. Mention its applications. **(10 Marks)**

b. Explain Ball-Milling method of synthesis of nanomaterials. **(06 Marks)**

c. Write any four applications of carbon nano tube. **(04 Marks)**

OR

10 a. Explain top-down and bottom-up approach in synthesis of nano-materials. **(06 Marks)**

b. Explain the construction and working of Reddy's shock tube. **(06 Marks)**

c. Describe the various quantum structures. **(08 Marks)**

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17PCD13/23

First/Second Semester B.E. Degree Examination, June/July 2019
Programming in C and Data Structures

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Design a general structure of C program and explain with an example. **(06 Marks)**

b. What are Identifiers? Define rules to declare an identifier. Identify the following words are valid / Invalid Identifier : i) asd123 ii) auto iii) 2K18 iv) @ india. **(06 Marks)**

c. Design a flow chart and develop a C – program to find area of a circle for the given radius. **(08 Marks)**

OR

2 a. Explain the formatted input and output statements in C with suitable examples. **(06 Marks)**

b. With example, explain Implicit and Explicit type conversion and convert the following Mathematical Expression to C – equivalent Expression.

i) area = $\sqrt{S(s-a)(s-b)(s-c)}$ ii) $\frac{x}{a+b}+\frac{y}{a-b}$ **(08 Marks)**

c. Write a C program to find largest of three numbers using ternary operator. **(06 Marks)**

Module-2

3 a. Explain the following selection statements with syntax and flow chart :
i) nested if ii) else – if ladder. **(06 Marks)**

b. With example bring out the differences between while loop and do – while loop. **(06 Marks)**

c. Design a C program to perform operations of a simple calculator using switch statement. Provide a provision to display an error message when an attempt is made to divide a number by zero. **(08 Marks)**

OR

4 a. Explain the working of for loop and write a C – program to find n – Fibonacci series, where n is specified by the user. **(08 Marks)**

b. Explain the following unconditional statements with syntax and example :
i) goto ii) continue. **(06 Marks)**

c. Design a C – program to read a Four – digit number from user and calculate the reverse of the number and check if the number is palindrome or not. **(06 Marks)**

Module-3

5 a. Define Array. Explain the methods of initializing one dimensional array with suitable examples. **(06 Marks)**

b. What are Functions? Explain the following terms with example.
i) Function declaration ii) Function definition iii) Function call. **(08 Marks)**

c. What is Recursion? Write a C program to find factorial of the given number using recursion. **(06 Marks)**

OR

6 a. Explain the String Manipulation Functions with syntax and code fragments.
i) strlen ii) strcmp. **(06 Marks)**

b. With example explain different type of Functions based in parameters. **(08 Marks)**

c. Write a C – Function to search an element in the given array using Linear search by passing array as an argument. **(06 Marks)**

Module-4

7 a. What is Structure? Explain the methods of declaration and initialization of structures with example. **(06 Marks)**

b. Write a C – program to maintain record of n employee details using array of structures with three fields (id, name, salary) and print details of employee whose salary is greater than 5000. **(08 Marks)**

c. What is a file? Explain fopen and fclose functions. **(06 Marks)**

OR

8 a. Explain the following file operations with example :
i) fprintf ( ) ii) fseek ( ) iii) fputc ( ). **(06 Marks)**

b. Explain Structure within a structure with example. **(08 Marks)**

c. Given a file "n.txt" which contains names. Write a C – program to create a new file "abc.txt" and copy the contents from "n.txt" to "abc.txt". **(06 Marks)**

Module-5

9 a. What are Pointers? How pointer variables are declared and initialized. **(06 Marks)**

b. Explain the concept of adding and deleting nodes in the linked list. **(07 Marks)**

c. Develop a C program to swap two numbers using pointers. **(07 Marks)**

OR

10 a. Explain different dynamic memory allocation schemes in C with example. **(08 Marks)**

b. Explain any three preprocessor directives with example. **(06 Marks)**

c. What is a Stack? Explain the operations on stack. **(06 Marks)**

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17CIV13/23

First/Second Semester B.E. Degree Examination, June/July 2019
Elements 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.Assume any missing data suitably.

Module-1

1 a. Explain briefly :
(i) Transportation Engineering
(ii) Structural Engineering
(iii) Environmental Engineering
(iv) Geotechnical Engineering
(v) Water resources and Irrigation Engineering **(10 Marks)**

b. Explain (i) types of Bridge and Culverts with simple sketches (ii) Types of dams based on material, structural behaviour and functionality with simple sketches. **(10 Marks)**

OR

2 a. Explain
(i) Static and Dynamic
(ii) Kinematics and Kinetics
(iii) Couple and Moment
(iv) Force and its characteristics
(v) Transmissibility of forces **(10 Marks)**

b. Find the moment of 500 N force about the point A, B, C and D as shown in Fig.Q2(b).

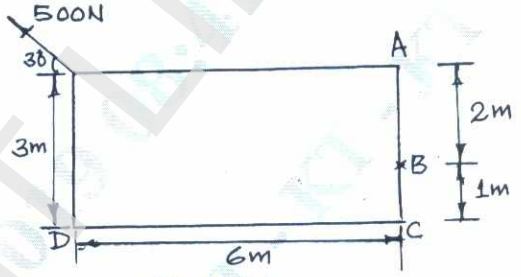

Fig.Q2(b) **(10 Marks)**

Module-2

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

b. Find the resultant of coplanar concurrent forces shown in Fig.Q3(b). **(08 Marks)**

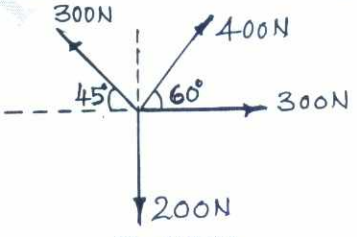

Fig.Q3(b)

c. State and prove parallelogram law of forces. **(08 Marks)**

OR

4 a. Explain
(i) Limiting friction (ii) Angle of friction (iii) Angle of repose (iv) Coefficient of friction **(08 Marks)**

b. Two blocks A and B weighing 2 kN and 1.5 kN are connected by a wire passing over a smooth frictionless pulley as shown in Fig.Q4(b). Determine the magnitude of force P required to impend the motion taking $\mu = 0.2$ **(12 Marks)**

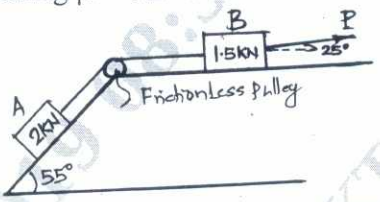

Fig.Q4(b)

Module-3

5 a. State and prove Varignon's theorem. **(06 Marks)**

b. Two spheres each of radius 100mm and weight 5 kN is in a rectangular box as shown in Fig.Q5(b). Calculate the reactions at all the points of contact. **(14 Marks)**

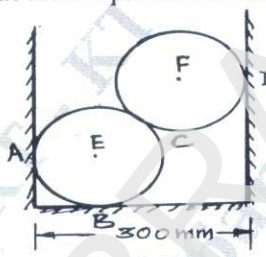

Fig.Q5(b)

OR

6 a. Explain the different types of supports with sketches. **(06 Marks)**

b. A beam ABCDE has a flexible link BC as shown in Fig.Q6(b). Determine the support reactions at A, D and E. **(14 Marks)**

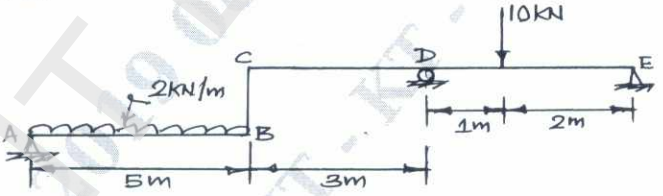

Fig.Q6(b)

Module-4

7 a. State and prove parallel axis theorem. **(06 Marks)**

b. Find the centroid of the shaded area shown in Fig.Q7(b), obtained by cutting a semicircle of diameter 100mm from the quadrant of a circle of radius 100 mm. **(14 Marks)**

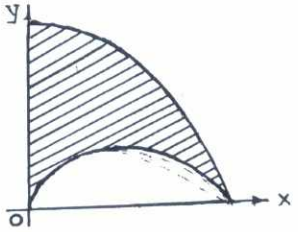

Fig.Q7(b)

OR

8 a. Explain the following (i) Centre of gravity (ii) Centroid (iii) Axis of symmetry. **(06 Marks)**

b. Determine the moment of inertia and radii of Gyration of the area shown in Fig.Q8(b) about the base AB and the centroidal axis parallel to AB. **(14 Marks)**

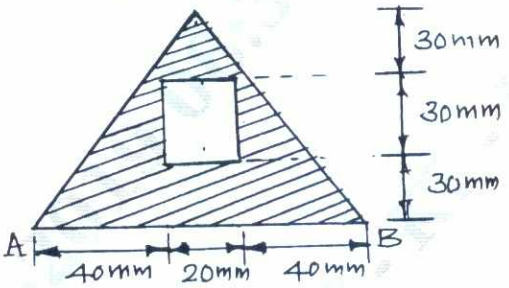

Fig.Q8(b)

Module-5

9 a. A stone is thrown upward with a velocity of 40 m/sec. Determine the time of the stone when it is at a height of 10m and is moving downwards. **(10 Marks)**

b. Two stones A and B are projected from the same point at inclination of 45° and 30° respectively to the horizontal. Find the ratio of the velocities of projection of A and B if the maximum height reached by then is the same. **(10 Marks)**

OR

10 a. A highway curve of 250m radius is banked for a speed of 45 kmph. Determine the amount of super elevation if the width of the road is 16m. **(06 Marks)**

b. An elevator being lowered into a mine shaft starts from test and attains a speed of 10 m/sec with in a distance of 15m. The elevator alone has a mass of 500 kg and it carries a box of mass 600kg is it. Find the total tension in the cables supporting the elevator, during the accelerated motion. Also find the total pressure between the box and the floor of the elevator. **(14 Marks)**

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CBCS SCHEME

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17EME14/24

Second Semester B.E. Degree Examination, June/July 2019
Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Distinguish between non–renewable and renewable sources of energy. **(06 Marks)**
b. With neat sketch describe working hydroelectric power plant. **(08 marks)**
c. What are bio fuels? Compare them with petroleum based fuels. **(06 Marks)**

OR

2 a. What is a boiler? Classify them. **(06 marks)**
b. Briefly describe stream formation with the help of T–H diagram. **(04 marks)**
c. Explain working of Babcock and Wilox boiler with a neat sketch. **(10 marks)**

Module-2

3 a. Distinguish between impulse and reaction steam turbines. **(06 Marks)**
b. Explain working of Kaplan water turbine. **(08 Marks)**
c. Compare petrol engine with diesel engine. **(06 Marks)**

OR

4 a. A four stroke single cylinder internal combustion engine has a volume of 6 litres and runs at 300 rpm. At full load, tight side and slack side tensions of belt dynometer are 700N and 300N respectively. The diameter of pulley dynometer is 1m. The mass of fuel is 4 kg/hr with a calorific value of 42000kJ/kg. If the indicated mean effective pressure is 6 bar, determine the brake power, indicated power, mechanical efficiency, indicated thermal efficiency and brake specific fuel consumption. **(10 Marks)**
b. With neat sketches explain working of four stroke petrol engine. **(10 Marks)**

Module-3

5 a. What is machine tool? Explain thread cutting and taper turning operations with neat sketches. **(08 Marks)**
b. Differentiate between reaming and boring. **(06 marks)**
c. Sketch and explain slot milling and end milling. **(06 Marks)**

OR

6 a. Compare NC machine tool with CNC machine. **(04 Marks)**
b. What is automation? Enlist advantages and limitation of robot physical configuration with neat sketches. **(16 Marks)**

Module-4

7 a. State the composition, properties of any four ferrous metals. (08 marks)
b. How are composite materials classified? Enlist their application in biomedical and military. (08 Marks)
c. Sketch and explain electric arc welding. (04 Marks)

OR

8 a. State the composition and applications of any four non ferrous metals. (08 Marks)
b. Compare welding with brazing. (06 marks)
c. Sketch and explain gas welding. (06 Marks)

Module-5

9 a. What is refrigeration? What are desirable properties of a good refrigerant? (06 marks)
b. Compare refrigeration system with air conditioning. (04 Marks)
c. Explain the principle and working of vapour absorption refrigeration with neat sketch. (10 Marks)

OR

10 a. Name commonly used refrigerants for different applications. (05 marks)
b. What is principle of refrigeration? Name essential parts of refrigerator and briefly explain their functions. (05 marks)
c. Explain the principle and working of room air conditioner with neat sketch. (10 Marks)

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17ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2019
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 Kirchhoff's laws with an example. **(06 Marks)**

b. A resistance R is connected in series with a parallel circuit comprising of 20Ω and 48Ω. The total power dissipated in the circuit is 1000w and the applied voltage is 250V. Calculate R and the current through R. **(06 Marks)**

c. State and explain Faraday's laws of electromagnetic induction. **(08 Marks)**

OR

2 a. Obtain an expression for energy stored in an inductor. **(06 Marks)**

b. A coil consists of 1000 turns and a current of 10A in the coil gives rise to a magnetic flux of 2mwb. Calculate i) self inductance of the coil ii) the energy stored iii) the emf induced when the current is reversed in 0.01sec. **(07 Marks)**

c. Define coefficient of coupling and derive its relationship with self inductances and the mutual inductance. **(07 Marks)**

Module-2

3 a. Derive the EMF equation of a DC generator. **(06 Marks)**

b. An 8 pole DC generator has 500 armature conductors and useful flux/pole of 0.065wb. What will be the emf generated if it is lap connected and runs at 1000rpm? At what speed if must be driven to produce the same emf if at is wave connected? **(06 Marks)**

c. With a neat diagram, explain the construction and working of an induction types energy meter. **(08 Marks)**

OR

4 a. Derive the expression for armature torque developed in a DC motor. **(06 Marks)**

b. A 4pole, 220V lap connected DC shunt motor has 36 slots, each slot containing 16 conductors. It draws a current of 40A from the supply. The field resistance and armature resistances are 110Ω and 0.1Ω respectively. The flux/pole is 40 mwb. Calculate i) the speed ii) the torque developed by the armature iii) shaft torque if the output power is 6 KW. **(08 Marks)**

c. With the help of a neat diagram, explain the construction and working principle of electrodynamometer type wattmeter. **(06 Marks)**

Module-3

5 a. Derive an expression for the power consumed in a series R–L– ac circuit and draw voltage, current and power waveform. **(06 Marks)**

b. With a neat sketch, explain 2-way control of lamps. **(06 Marks)**

c. A series circuits of a resistance of 10Ω, an inductance of 16mH and a capacitance of 150μF connected in series. A supply of 100V at 50Hz is given to the circuit. Find the impedance, current p.f and power consumed in the circuit. **(08 Marks)**

OR

6 a. Prove that the power consumed in a pure capacitor is zero, when connected to an alternating voltage source. Draw the waveforms for voltage, current and power **(06 Marks)**

b. What is earthing? Explain any one type of earthing with a neat diagram. m **(06 Marks)**

c. A parallel circuit has a resistor of 20Ω in series with an inductive reactance of 15Ω in one branch and a resistor of 30Ω in series with a capacitive reactance of 20Ω in the other branch. If the total current drawn by the parallel circuit is $10\angle -30$ Amps, determine the current and power dissipated in each branch. **(08 Marks)**

Module-4

7 a. Obtain the relationship between phase and line values of voltages and currents in a balanced star connected system. **(06 Marks)**

b. With neat sketches, explain the construction of two types of alternators. **(08 Marks)**

c. A 3-phase 50Hz, 16 pole alternator with star connected winding has 144 slots with 10 conductors/slot. The flux/pole is 24.8 mwb and the coils are full pitched. Find: i) the speed ii) the line emf. Assume the distribution factor kd = 0.96. **(06 Marks)**

OR

8 a. Show that two wattmeters are sufficient to measure 3 phase power and power factor of the circuit in a 3 phase balanced circuit. **(08 Marks)**

b. A balanced 3 phase star connected system draws power from 440V supply. The 2 wattmeters connected indicate W_1 = 5Kw and W_2 = 1.2 KW. Calculate power, power factor and current in the circuit. **(06 Marks)**

c. Derive the emf equation of an alternator with usual notations. **(06 Marks)**

Module-5

9 a. Explain the principle of working of a single phase transformer and derive the expression for K. **(06 Marks)**

b. The primary winding of a 25KVA transformer has 200 turns and is connected to 230, 50Hz supply. The secondary turns are 50. Calculate : i) no load secondary emf ii) full load primary and secondary currents iii) the flux density in the core, if the cross section of the core 60cm^2. **(06 Marks)**

c. Explain the concept of rotating magnetic field in case of a 3phase induction motor. **(08 Marks)**

OR

10 a. Explain the losses occurring in a single phase transformer. **(06 Marks)**

b. A transformer is rated at 100KVA. At full load its copper loss is 1200W and the iron loss is 960W. Calculate :
   i) The efficiency of full load, u.p.f
   ii) The efficiency of at half load, 0.8p.f
   iii) The load KVA at which maximum efficiency occurs
   iv) Maximum efficiency at 0.85 p.f. **(08 Marks)**

c. A 4 pole, 3-ϕ, 50Hz induction motor runs at a speed of 1470rpm. Find the synchronous speed, the slip and frequency of the induced emf in the rotor under this condition. **(06 Marks)**

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CBCS SCHEME

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17ELN15/25

First/Second Semester B.E. Degree Examination, June/July 2019
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. What is PN junction diode? With the help of circuit diagram, explain the VI characteristics of a diode. **(07 Marks)**

b. What is rectifier circuit? Explain the classification of the rectifier. Derive the following expressions for Half-wave rectifier: (i) I_{dc} (ii) I_{rms} (iii) η (iv) γ **(08 Marks)**

c. Design a Zener diode voltage regulator circuit to meet the following specifications: $I_L = 20$ mA, Vo = 5V, $P_z = 500$ mW, Vi = 12 ± 2V and $I_{zmin} = 8$ mA. **(05 Marks)**

OR

2 a. What is a transistor? What are its applications? Explain the various current gains in a transistor and derive the relation between α and β. **(07 Marks)**

b. With a neat circuit diagram, explain the input and output characteristics of the common emitter configuration. **(08 Marks)**

c. Explain the operation of full wave rectifier with capacitor filter. **(05 Marks)**

Module-2

3 a. For the base bias circuit, $V_{CC} = 18$V, $R_C = 2.2$ KΩ, $R_B = 470$ KΩ and $\beta = 100$. Find I_B, I_C and V_{CE}. Draw the DC load line and locate the operating point. **(07 Marks)**

b. Draw the circuit diagram of the voltage divider biasing circuit. Derive the expressions of I_B and V_{CE}. **(05 Marks)**

c. List out the various deal op-amp characteristics. Explain the terms CMRR and Slew rate. **(08 Marks)**

OR

4 a. Derive the output equation of the inverting adder. Design an adder op-amp circuit to obtain an output voltage $V_0 = -(0.1V_1 + 0.5V_2 + 20V_3)$. Select $R_f = 10$ KΩ. **(07 Marks)**

b. What is an integrator? Derive its output equation. **(05 Marks)**

c. Derive the output expressions for the following op-amp applications:
(i) Voltage follower (ii) Subtractor **(08 Marks)**

Module-3

5 a. What are Radix-2, Radix-8, Radix-10 and Radix-16 number system? Perform the following operations:
i) $(1234.56)_8 = (?)_{10}$ ii) $(BAD.DAD)_{16} = (?)_8$ iii) $(988.86)_{10} = (?)_{16}$ **(08 Marks)**

b. Perform the following using 2's complement method:
i) $(15)_{10} - (28)_{10}$ ii) $(1011.10)_2 - (1000.01)_2$ **(05 Marks)**

c. Write the symbol and truth table of the following gates:
i) AND ii) NOR iii) XOR iv) NAND **(07 Marks)**

OR

6 a. Simplify and realize the following Boolean expressions using basic gates:
i) $Y = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,\overline{B} + A\overline{B}$
ii) $Y = ABC + A\overline{B}C + AB\overline{C} + \overline{A}BC$
iii) $Y = (\overline{A+B})(\overline{A}+\overline{C})(\overline{B}+C)$ **(08 Marks)**

b. Implement XOR gate using only NOR gates. **(05 Marks)**

c. Write truth table of half-adder and full-adders. Realize the full-adder using two half-adders. **(07 Marks)**

Module-4

7 a. What is flip-flop and latch? Explain the operation of SR latch using NAND gates. **(07 Marks)**

b. Explain the working of clocked SR flip-flop with a suitable logic diagram and a truth table. **(08 Marks)**

c. Explain the working of NAND gate latch and NOR gate latch. **(05 Marks)**

OR

8 a. What is microcontroller? List out the main features of 8051 microcontroller. **(05 Marks)**

b. With a neat block diagram, explain the architecture of 8051 microcontroller. **(09 Marks)**

c. What is stepper motor? Explain the working and interfacing of stepper motor to a 8051 microcontroller. **(06 Marks)**

Module-5

9 a. What is amplitude modulation and frequency modulation? With the help of neat waveform, derive the expression for AM wave. **(07 Marks)**

b. A carrier signal with A_C = 40 V and f_c = 1 MHz is amplitude modulated with a modulating signal A_m = 4V and f_m = 2.5 kHz. The depth of the modulation is 75%. Calculate the following: (i) P_C (ii) P_T (iii) P_{SB} (iv) BW (v) Sideband frequencies. Assume R = 2Ω. **(07 Marks)**

c. What is demodulation? Explain the working of AM detector circuit. **(06 Marks)**

OR

10 a. What is transducer? Explain the working of resistance transducer and resistance thermometer. **(07 Marks)**

b. What is LVDT? Explain the construction, operation and applications of LVDT. **(07 Marks)**

c. Explain the working of piezoelectric and photoelectric transducers. **(06 Marks)**

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CBCS SCHEME

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17MAT21

Second Semester B.E. Degree Examination, June/July 2019
Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Solve $(D^2+1)y = 3x^2+6x+12$. **(06 Marks)**

b. Solve $(D^3+2D^2+D)y = e^{-x}$. **(07 Marks)**

c. By the method of undetermined coefficients, solve $(D^2+D-2)y = x+\sin x$. **(07 Marks)**

OR

2 a. Solve $(D^2-6D+9)y = 6e^{3x}+7e^{-2x}$. **(06 Marks)**

b. Solve $(D^3-D)y = (2x+1)+4\cos x$. **(07 Marks)**

c. By the method of variation of parameters, solve $(D^2+1)y = \operatorname{cosec} x$. **(07 Marks)**

Module-2

3 a. Solve $x^2y''-3xy'+4y = 1+x^2$. **(06 Marks)**

b. Solve $xyp^2-(x^2+y^2)p+xy = 0$. **(07 Marks)**

c. Solve $(px-y)(py+x) = a^2p$ by taking $x^2 = x$ and $y^2 = y$. **(07 Marks)**

OR

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

b. Solve $yp^2+(x-y)p-x = 0$. **(07 Marks)**

c. Obtain the general and singular solution of the equation $\sin px\cos y = \cos px\sin y+p$. **(07 Marks)**

Module-3

5 a. Form a partial differential equation by eliminating arbitrary function
$lx+my+nz = \phi(x^2+y^2+z^2)$ **(06 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x^2} = xy$ subject to the conditions $\frac{\partial z}{\partial x} = \log(1+y)$ when $x = 1$ and $z = 0$ when $x = 0$. **(07 Marks)**

c. Derive an expression for the one dimensional wave equation. **(07 Marks)**

OR

6 a. Form a partial differential equation $z = f(y+2x)+g(y-3x)$. **(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 heat equation $u_t = c^2u_{xx}$ by the method of separation of variables. **(07 Marks)**

Module-4

7 a. Evaluate $\iint r\sin\theta \, dr \, d\theta$ over the cardioids $r = a(1-\cos\theta)$ above the initial line. **(06 Marks)**

b. Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x \, dz \, dx \, dy$. **(07 Marks)**

c. Derive the relation between Beta and Gamma function as $B(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. **(07 Marks)**

OR

8 a. Evaluate by changing the order of integration $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy dx$. **(06 Marks)**

b. Find by double integration, the area lying between the parabola $y = 4x - x^2$ and the line $y = x$. **(07 Marks)**

c. Show that $\int_0^{\pi/2} \sqrt{\cot\theta} \, d\theta = \frac{1}{2}\Gamma\left(\frac{1}{4}\right)\Gamma\left(\frac{3}{4}\right)$ **(07 Marks)**

Module-5

9 a. Find the Laplace transform of $\left(t\cos 2t + \frac{1-e^{3t}}{t}\right)$. **(06 Marks)**

b. Find the Laplace transform of $f(t) = E\sin\omega t$, $0 < t < \frac{\pi}{\omega}$ having the period $\frac{\pi}{\omega}$. **(07 Marks)**

c. Solve $y'' - 3y' + 2y = 2e^{3t}$, $y(0) = y'(0) = 0$ by using Laplace transforms. **(07 Marks)**

OR

10 a. Find the inverse Laplace transforms of $\frac{s+1}{s^2+2s+2} + \log\left(\frac{s+a}{s+b}\right)$. **(06 Marks)**

b. By using convolution theorem, find $L^{-1}\left[\frac{s}{(s^2+1)(s-1)}\right]$. **(07 Marks)**

c. Express $f(t) = \begin{cases} \sin t, & 0 < t \le \pi/2 \\ \cos t, & \pi/2 < t \le \pi \\ 1, & \pi < t \end{cases}$ in terms of unit step functions and hence find its Laplace transform. **(07 Marks)**

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CBCS SCHEME

17CIV18/28

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First/Second Semester B.E Degree Examination, June/July 2019
Environmental Studies
(COMMON TO ALL BRANCHES)

Time: 2 hrs.] [Max. Marks: 30

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the thirty questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. The term environment has been derived from _____ word.
   a) Greek b) French c) Latin d) Spanish

2. Which of the following components of the environment are effective transporters of matter?
   a) Atmosphere & Hydrosphere b) Atmosphere & Lithosphere
   c) Hydrosphere & Lithosphere d) Biosphere & Lithosphere

3. Atmosphere consists of 78% Nitrogen and 21% Oxygen by
   a) weight b) density c) volume d) All of these

4. In an ecosystem the flow of energy is
   a) Unidirectional b) Cyclic c) Bidirectional d) Multidirectional

5. In an aquatic ecosystem phytoplankton can be considered as a
   a) consumer b) producer
   c) saprotrophic organisms d) macroconsumer

6. The World Environment day is on
   a) 5th May b) 6th October c) 5th June d) 18th July

7. Which of the following is not the environmental effect of industrialization?
   a) Solid waste b) Water pollution c) Air pollution d) Economic growth

8. Mining means
   a) to conserve & preserve minerals b) to extract minerals and ores
   c) to check pollution due to mineral resources d) None of these.

9. E. I. A can be expanded as
a) Environment & Industrial Act
b) Environment and Impact Activities
c) Environment Impact Assessment
d) Environmentally Important Activity

10. "Earth Day" is held every year on
a) 22^{nd} April
b) 5^{th} June
c) 26^{th} January
d) 23^{rd} November

11. Soil erosion removes surface soil which contains
a) Organic matter
b) Plant nutrients
c) both (a) & (b)
d) None of these

12. Organic farming is
a) farming without using chemical, fertilizers and pesticides
b) Enhances Biodiversity
c) Promotes soil biological activity
d) All of the above.

13. What is the percentage of forest cover a country should posses?
a) 33%
b) 23%
c) 43%
d) 13%

14. As per Indian standards what is the permissible range of pH for drinking water?
a) 6 to 9
b) 6.5 to 8.5
c) 6 to 8.5
d) 6.5 to 7.5

15. What is the maximum allowable concentration of fluorides in drinking water?
a) 1.50 mg/litre
b) 1.0 mg/litre
c) 1.25 mg/litre
d) 1.75 mg/litre

16. Excess of Nitrate in water causes
a) Typhoid
b) Cholera
c) Blue baby disease
d) Malaria

17. Conversion of nitrates into nitrogen is called
a) Nitrification
b) Nitrogen fixing
c) Denitrification
d) Reduction

18. Water borne disease is caused due to
a) contaminated sewage for irrigation
b) leaching of untreated faecal and urinary discharge into water bodies
c) discharge of industrial waste water
d) by eating contaminated food

19. Which of the following is not a renewable source of energy?
a) Fossil fuels
b) Solar energy
c) Tidal wave energy
d) Wind energy

20. Which of the following is the source of fly ash?
a) Vehicular exhaust
b) Sewage
c) Thermal power plant
d) None of these

21. Sound beyond which of the following level can be regarded as a pollutant?
a) 40 dB
b) 80 dB
c) 120 dB
d) 150 dB

22. Identify the non-renewable source of energy from the following :
a) coal
b) fuel cells
c) wind power
d) wave power

23. Air pollution from automobiles can be controlled by fitting
a) Electrostatic precipitator b) Wet scrubber
c) Catalytic converter d) All of these

24. Which of the following is not the effect of urbanization?
a) Thermal pollution b) Air pollution
c) Noise pollution d) Solid waste production

25. Environmental (protection) Act was enacted in the year
a) 1992 b) 1984 c) 1986 d) 1974

26. The water (Prevention and Control of Pollution) Act was enacted in the year
a) 1986 b) 1974 c) 1994 d) 2004

27. The first major Environmental Protection Act to be promulgated in India was
a) The Wild Life Protection Act b) The Air Act
c) The Noise Pollution Act d) None of these

28. Which of the following is NGO:
a) Narmada Bachao Andolan b) CPCB
c) KSPCB d) None of these

29. An important NGO involved in Global environmental protection is
a) UNICEF b) Green Peace c) WHO d) CPCB

30. World summit on sustainable development was held at
a) Johannesburg in 2002 b) Kyoto in 1994
c) Rio de Janeiro in 1992 d) Stockholm in 2000

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