CBCS Scheme

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15MAT11

First Semester B.E. Degree Examination, June/July 2017
Engineering Mathematics - I

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Obtain the n^{th} derivative of $\frac{x}{(x-1)^2(x+2)}$. **(06 Marks)**

b. Find the angle of intersection of the curves $r = a(1+\sin\theta)$ and $r = a(1-\sin\theta)$. **(05 Marks)**

c. Find the radius of curvature at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on the curve $x^3 + y^3 = 3axy$. **(05 Marks)**

OR

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

b. Obtain the pedal equation of the curve $r^n = a^n \cos n\theta$. **(05 Marks)**

c. Find the derivative of arc length of $x = a(\cos t + \log \tan(\frac{t}{2}))$ and $y = a \sin t$. **(05 Marks)**

Module-2

3 a. Expand $\log_e x$ in powers of $(x - 1)$ and hence evaluate $\log_e(1.1)$, correct to four decimal places. **(06 Marks)**

b. If $z = \sin(ax + y) + \cos(ax - y)$, prove that $\frac{\partial^2 z}{\partial x^2} = a^2 \frac{\partial^2 z}{\partial y^2}$. **(05 Marks)**

c. If $u = x^2 + y^2 + z^2$, $v = xy + yz + zx$, $w = x + y + z$, then find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$. **(05 Marks)**

OR

4 a. If $u(x+y) = x^2 + y^2$, then prove that $\left(\frac{\partial u}{\partial x} - \frac{\partial u}{\partial y}\right)^2 = 4\left(1 - \frac{\partial u}{\partial x} - \frac{\partial u}{\partial y}\right)$. **(06 Marks)**

b. Evaluate $\lim_{x \to 0}\left(\frac{a^x + b^x + c^x + d^x}{4}\right)^{1/x}$. **(05 Marks)**

c. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, then prove that $x\, u_x + y\, u_y + z\, u_z = 0$. **(05 Marks)**

Module-3

5 a. A particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where t is the time. Find the components of velocity and acceleration at time $t = 1$ in the direction $\hat{i} - 3\hat{j} + 2\hat{k}$. **(06 Marks)**

b. If $\vec{f} = (x + y + az)\,\hat{i} + (bx + 2y - z)\,\hat{j} + (x + cy + 2z)\,\hat{k}$, find a, b, c such that $\vec{f}$ is irrotational. **(05 Marks)**

c. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point P(2, -1, 2). **(05 Marks)**

OR

6 a. Find the directional derivative of $xy^3 + yz^3$ at (2, -1, 1) in the direction of the vector $\hat{i} + 2\hat{j} + 2\hat{k}$. **(06 Marks)**

b. If $\vec{u} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$ and $\vec{v} = yz\hat{i} + zx\hat{j} + xy\hat{k}$, show that $\vec{u} \times \vec{v}$ is a solenoidal vector. **(05 Marks)**

c. For any scalar field ϕ and any vector field $\vec{f}$, prove that curl $(\phi \vec{f}) = \phi$ curl $\vec{f}$ + (grad ϕ) $\times \vec{f}$. **(05 Marks)**

Module-4

7 a. Obtain the reduction formula for $\int \cos^n x \, dx$, where n is a positive integer, hence evaluate $\int_0^{\pi/2} \cos^n x dx$. **(06 Marks)**

b. Solve : $(x^2 + y^2 + x)\,dx + xydy = 0$. **(05 Marks)**

c. Find the orthogonal trajectories of the family of circles $r = 2a \cos\theta$, where 'a' is a parameter. **(05 Marks)**

OR

8 a. Evaluate $\int_0^{\infty} \frac{x^6}{(1+x^2)^{9/2}} dx$. **(06 Marks)**

b. Solve $xy(1 + xy^2)\frac{dy}{dx} = 1$. **(05 Marks)**

c. Water at temperature 10^0C takes 5 minutes to warm upto 20^0C in a room temperature 40^0C. Find the temperature after 20 minutes. **(05 Marks)**

Module-5

9 a. Solve the following system of equations by Gauss Elimination Method. **(06 Marks)**
$x + 2y + z = 3$, $2x + 3y + 2z = 5$, $3x - 5y + 5z = 2$.

b. Find the dominant eigen value and the corresponding eigen vector by power method $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$, perform 5 iterations, taking initial eigen vector as $[1\ 1\ 1]^1$. **(05 Marks)**

c. Show that the transformation $y_1 = 2x + y + z$, $y_2 = x + y + 2z$, $y_3 = x - 2z$ is regular. Write down the inverse transformation. **(05 Marks)**

OR

10 a. Solve the following system of equations by Gauss – Seidel method. **(06 Marks)**
$10x + 2y + z = 9$, $x + 10y - z = -22$, $-2x + 3y + 10z = 22$.

b. Reduce the matrix $A = \begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$ to the diagonal form. **(05 Marks)**

c. Reduce $8x^2 + 7y^2 + 3z^2 - 12xy + 4xz - 8yz$ into canonical form. **(05 Marks)**

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CBCS Scheme

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15PHY12/22

First/Second Semester B.E. Degree Examination, June/July 2017
Engineering Physics

Time: 3 hrs. Max. Marks: 80

Note: **1.** ***Answer FIVE full questions, choosing one full question from each module.***
2. ***Physical constants : Velocity of light, $c = 3 \times 10^8$ m/s; $h = 6.625 \times 10^{-34}$ J-S; $k = 1.38 \times 10^{-23}$ J/K; $N_A = 6.02 \times 10^{28}$/Kmole; $m_e = 9.1 \times 10^{-31}$ kg; $e = 1.6 \times 10^{-19}$ C.***

Module-1

1 a. Define phase velocity and group velocity. Derive an expression for group velocity interms of phase velocity. **(05 Marks)**

b. What is wave function? Set up time-in-dependent Schrodinger's wave equation in one dimension. **(07 Marks)**

c. A spectral line of wavelength 5896 Å has a width of 10^{-5} Å. Evaluate the minimum time spent by the electrons in the upper energy state between the excitation and de-excitation processes. **(04 Marks)**

OR

2 a. What is a blackbody? Explain energy spectrum of a Blackbody. **(05 Marks)**

b. Obtain energy values and normalized wave function, with respect to a particle in an one dimensional potential well of infinite height. **(07 Marks)**

c. Compare the energy of a photon with that of an Neutron when both are associated with a wavelength 0.25 nm, mass of neutron is 1.675×10^{-27} kg. **(04 Marks)**

Module-2

3 a. State law of mass action and derive the expression for electrical conductivity of a semiconductor. **(05 Marks)**

b. Write a note on high temperature superconductors and Maglev vehicles. **(07 Marks)**

c. Gold has one free electron/atom. Its density, atomic weight and resistivity are 19300 kg/m^3, 197 and 2.21×10^{-8} Ωm. Calculate the free electron concentration and mobility of conduction electron. **(04 Marks)**

OR

4 a. What is Fermi factor? Discuss the variation of Fermi factor with temperature. **(05 Marks)**

b. What are the assumptions of quantum free electron theory? Derive the expression for electrical conductivity based on quantum free electron theory. **(07 Marks)**

c. Calculate the drift velocity and thermal velocity of conduction electrons in copper at a temperature of 300 K, when a copper wire of length 2 m and resistance 0.02 Ω carries a current of 15 A. Given the mobility of free electrons in copper is 4.3×10^{-3} m^2/V.S. **(04 Marks)**

Module-3

5 a. Explain the construction and working of a semi-conductor laser. **(06 Marks)**

b. Explain three different types of optical fibers with neat diagrams. **(06 Marks)**

c. A pulsed laser emits photons of wavelength 820 nm with 22 mW average power/pulse. Calculate the number of photons contained in each pulse, if the pulse duration is 12 ns. **(04 Marks)**

OR

6 a. Derive the expression for energy density of radiation interms of Einstein's coefficients. **(06 Marks)**

b. What is attenuation? Explain factors contributing to the fiber losses. **(06 Marks)**

c. A glass clad fiber is made with core glass of refractive index 1.5 and cladding is doped to give a fractional index difference of 0.0005. Determine the cladding index and numerical aperture. **(04 Marks)**

Module-4

7 a. Derive the expression for interplanar spacing interms of Miller Indices. **(05 Marks)**

b. Describe how Bragg's spectrometer is used to determine the crystal structure. **(07 Marks)**

c. Draw the following planes in a cubic unit cell,

i) (001) ii) $(1\bar{1}\ 0)$ iii) (1 1 2) iv) (0 2 0). **(04 Marks)**

OR

8 a. Define Allotropy and polymorphism with examples. **(05 Marks)**

b. What are lattice parameters? Explain seven crystal systems. **(07 Marks)**

c. Find the Miller indices of a set of parallel planes which make intercepts in the ratio 3a:4b and parallel to z-axis and also calculate the interplanar distance of the planes taking the lattice to be cubic with a = b = c = 2Å. **(04 Marks)**

Module-5

9 a. What is Mach number? Explain experimental method of finding Mach number of a shock wave by Reddy Shock tube. **(06 Marks)**

b. Describe arc discharge method of obtaining carbon nano tubes with the help of a diagram. **(06 Marks)**

c. Distinguish between acoustic, ultrasonic, subsonic and supersonic waves. **(04 Marks)**

OR

10 a. Discuss the basis of laws of conservation of energy, mass and momentum. **(07 Marks)**

b. Discuss the structure and properties of carbon nano tubes. **(05 Marks)**

c. Explain Sol-gel method of preparing nanomaterials. **(04 Marks)**

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15CHE12/22

First/Second Semester B.E. Degree Examination, June/July 2017
Engineering Chemistry

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Write Electrode reactions and Net cell reaction of
i) Nickel – Metal hydride battery ii) Methanol – oxygen fuel cell. **(06 Marks)**

b. Describe the construction and working of Lithium ion battery. **(05 Marks)**

c. Derive Nernst equation for Single Electrode Potential. **(05 Marks)**

OR

2 a. What are Concentration Cells? Calculate the cell potential of the following cell at 298K.
Ag/Ag Cℓ (0.005M) // Ag Cℓ (0.5M)/ Ag **(06 Marks)**

b. Explain the measurement of electrode potential using Calomel electrode as secondary reference electrode. **(05 Marks)**

c. Define Fuel Cell. What are the differences between Fuel cell and Conventional cell? **(05 Marks)**

Module-2

3 a. What is Galvanisation and Tinning? Explain Galvanisation process by Hot dipping method. **(06 Marks)**

b. Explain Electrochemical theory of corrosion with an example. **(05 Marks)**

c. What is Electroplating? What are the differences between Electroplating and Electroless plating? **(05 Marks)**

OR

4 a. Explain Electroless plating of copper with suitable reactions. **(06 Marks)**

b. Describe Electroplating of Nickel using Watt's bath. **(05 Marks)**

c. Explain the following factors affecting the rate of corrosion : i) Nature of corrosion product ii) Ratio of Anodic to Cathodic area iii) Conductivity. **(05 Marks)**

Module-3

5 a. Define Gross calorific and Net calorific value of a fuel. Calculate the gross and net calorific value of a sample of coal from following data : **(06 Marks)**
Weight of coal = 0.95g ; Weight of water = 2500g ;
Water equivalent of calorimeter = 400g ; Specific heat of water = 4.187 J/g / K ;
Rise in temperature = 3K ; % of Hydrogen in coal = 6
Latent heat of steam = 2454 J/g/K.

b. Write a short note on Power Alcohol and Biodiesel. **(05 Marks)**

c. Explain Modules, Panels and Arrays of photovoltaic cells. **(05 Marks)**

OR

6 a. Explain the production of solar grade silicon by Union Carbide process. **(06 Marks)**

b. Explain Doping of silicon by diffusion technique to produce n – type and p – type semiconductors. **(05 Marks)**

c. Describe Synthesis of petrol by Fischer – Tropsch process. **(05 Marks)**

Module-4

7 a. Explain Free Radical mechanism of addition polymerisation taking vinyl chloride as an example. **(06 Marks)**

b. What are Elastomers? Explain synthesis, properties and applications of silicone rubber. **(05 Marks)**

c. What is Glass Transition Temperature? Explain any two factors affecting glass transition temperature. **(05 Marks)**

OR

8 a. A polymer is found to contain the following composition : **(06 Marks)**
200 molecules of molecular mass 2000 g/mol ,
300 molecules of molecular mass 3000 g/mol ,
500 molecules of molecular mass 5000 g/mol. Calculate number average molecular weight and weight average molecular weight of polymer.

b. Discuss Structure property relationship of polymers with respect to **(05 Marks)**
i) Elasticity ii) Chemical resistivity.

c. Explain the Mechanism of conduction in polyaniline. **(05 Marks)**

Module-5

9 a. Write a note on Nanocomposites. Mention its applications. **(05 Marks)**

b. Discuss the synthesis of nanomaterials by Sol – gel process and by precipitation method. **(06 Marks)**

c. Explain the Activated Sludge treatment of sewage water. **(05 Marks)**

OR

10 a. Define BOD. Discuss the experimental determination of BOD of waste water. **(06 Marks)**

b. $50cm^3$ of sewage water was refluxed with $20cm^3$ of 0.1N acidified $K_2Cr_2O_7$. The unreacted acidified $K_2Cr_2O_7$ consumed $10.2cm^3$ of 0.1NFAS. $20cm^3$ of 0.1N $K_2Cr_2O_7$ when titrated under identical condition consumed $31.1cm^3$ of 0.1NFAS. Calculate the COD of sewage water. **(05 Marks)**

c. Write a note on Carbon nanotubes. **(05 Marks)**

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15CIV13/23

First/Second Semester B.E. Degree Examination, June/July 2017
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain briefly the scope of the following civil engineering fields:
i) Environmental engineering
ii) Transportation engineering. **(06 Marks)**

b. Explain: i) Static and dynamics
ii) Kinematics and kinetics
iii) Couple and moment of couple **(06 Marks)**

c. Find the components of 100 N force shown in Fig.1(c) along general x and y axes shown.

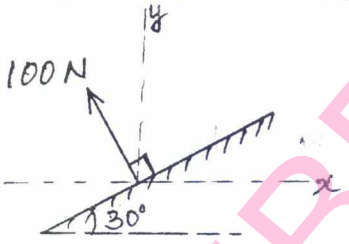


Fig.1(c) **(04 Marks)**

OR

2 a. Explain the terms: (i) Kerbs, (ii) Skew bridge, (iii) Spillways, (iv) Subgrade. **(08 Marks)**

b. With example, explain the characteristics of a force. **(04 Marks)**

c. Transfer the force acting at point A to the point B. Refer Fig.Q2(c).

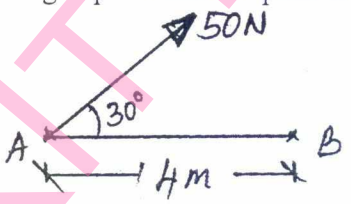


Fig.Q2(c) **(04 Marks)**

Module-2

3 a. Four coplanar concurrent forces are acting at a point '0' as shown in Fig.Q3(a). Determine the resultant completely.

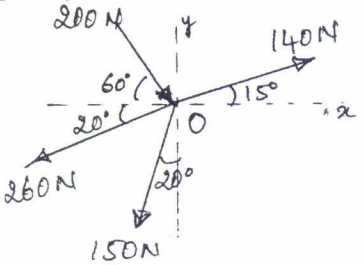


Fig.Q3(a) **(08 Marks)**

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

OR

4 a. Three cylinders A, B and C of diameter 200 mm, 300 mm and 250 mm and weight 75 N, 200 N and 100 N respectively are placed in a ditch as shown in Fig.Q4(a). Assuming contact surfaces smooth, determine the reaction between cylinder A and the vertical wall.

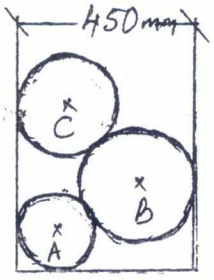


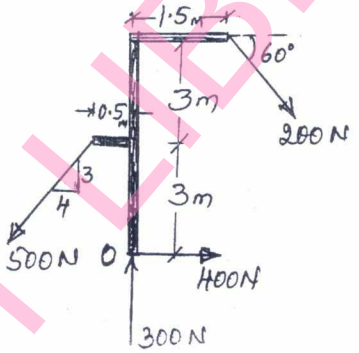
Fig.Q4(a) **(08 Marks)**

b. A pull of 180 N applied upward at 30° to a rough horizontal plane was required to just move a body resting on the plane, while a push of 220 N applied along the same line of action was required to just move the same body. Determine the weight of body and the coefficient of friction. **(08 Marks)**

Module-3

5 a. With the nature of reaction, explain: (i) fixed support, (ii) Hinged support, (iii) simple support. **(06 Marks)**

b. Determine completely the resultant of the system of four forces acting on the body shown in Fig,Q5(b) with respect to point '0'.



Fig,Q5(b) **(10 Marks)**

OR

6 a. Give the statement and application of Varignon's theorem. **(04 Marks)**

b. With sketch, explain space diagram (SPD) and free body diagram (FBD). **(04 Marks)**

c. Find the support reactions for the beam loaded as shown in Fig.Q6(c).

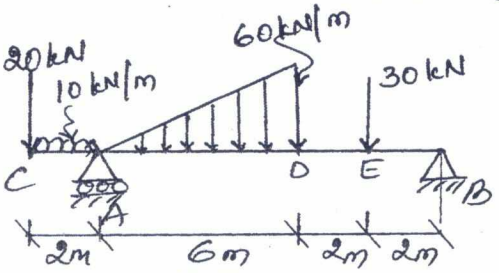


Fig.Q6(c) **(08 Marks)**

Module-4

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

b. Locate the centroid of the plane area shown in Fig.Q7(b).

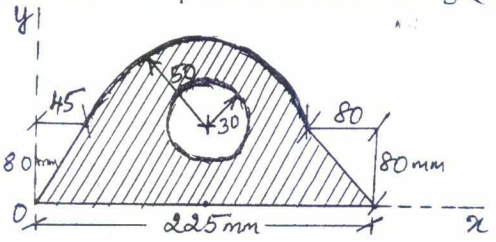


Fig.Q7(b) **(10 Marks)**

OR

8 a. Determine the centroid of a triangle by first principle. **(06 Marks)**

b. For the cross section shown in Fig.Q8(b), calculate the MI about the centroidal axis parallel to top edge. Also determine the radius of gyration.

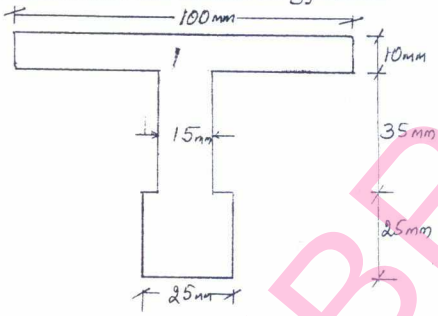


Fig.Q8(b) **(10 Marks)**

Module-5

9 a. A stone is dropped into a well. After 4 seconds the sound of splash is heard. If the velocity of sound is 330 m/sec, find the depth of the well up to water surface. **(10 Marks)**

b. Explain with a sketch for projectile motion:

i) Range ii) Time of flight

iii) Maximum height iv) Angle of projection **(06 Marks)**

OR

10 a. A stone is projected with a velocity of 20 m/sec perpendicular to the incline as shown in Fig.Q10(a). Determine the range R on the inclined plane.

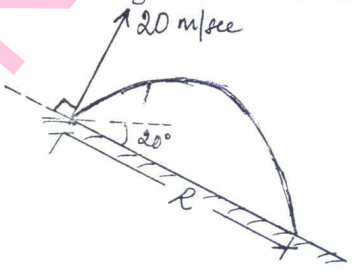


Fig.Q10(a) **(06 Marks)**

b. Explain: (i) Super elevation, (ii) Relative motion. **(04 Marks)**

c. A body moves in a straight line has the equation of motion given by $S = 2t^3 - 4t + 10$. Determine:

i) The time required for the body to gain a velocity of 68 m/sec starting from rest.

ii) The acceleration of the body when the velocity is equal to 32 m/sec. **(06 Marks)**

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15PCD13/23

First/Second Semester B.E. Degree Examination, June/July 2017
Programming in C and Data Structures

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define Pseudo code. Explain with an example. **(05 Marks)**

b. Write a C program to find biggest among three numbers using ternary operator. **(05 Marks)**

c. Explain the following constants with example
   i) Integer constant
   ii) Floating constant
   iii) Character constant. **(06 Marks)**

OR

2 a. List the formatted input/output functions of C language. Explain the basic structure of C program with proper syntax and example. **(06 Marks)**

b. Define an algorithm. Write an algorithm to find the area of circle and triangle. **(06 Marks)**

c. Evaluate the following expression/code segment
   i) 22 + 3 < 6 && ! 5 || 22 = = 7&& 22 – 2 > = 5
   ii) a + 2 > b || ! c && a = = d || a – 2 < = e
   where a = 11, b = 6, c = 0, d = 7 and e = 5 **(04 Marks)**

Module-2

3 a. List all branching statements. Explain any two with proper syntax and example. **(06 Marks)**

b. Explain switch case statement with syntax and example. **(05 Marks)**

c. Write a C program to find whether given year is leap year or not. **(05 Marks)**

OR

4 a. Write the syntax of all looping control statements. Explain how break and continue statements are used in C program with example. **(06 Marks)**

b. Write a C program to find the square root of a given number without using library function. **(05 Marks)**

c. List the difference between while and do-while loop. **(05 Marks)**

Module-3

5 a. Define the array. How one and two dimensional arrays are declared and initialized? Explain. **(07 Marks)**

b. Write C program to evaluate the polynomial equation $f(x) = a_0 + a_1x + a_2x^2 + \ldots . a_{n-1}x^{n-1} + a_n x^n$ for given constant 'x' and its co-efficients. **(04 Marks)**

c. Explain string Input/output functions with example. **(05 Marks)**

OR

6 a. Explain how strings are declared and initialized with syntax and example. **(06 Marks)**

b. Write a C program to find the addition of two matrices. **(04 Marks)**

c. Explain function definition, function call and function declaration with example. **(06 Marks)**

Module-4

7 a. Define structure. Explain how structure members are accessed using dot (•) operator with example. **(05 Marks)**

b. Show how structure variables are passed as a parameter to a function with example. **(05 Marks)**

c. Write a C program to maintain record of 'n' students detail using array of structures with four fields (Rno, name, marks, grade). Each field is an appropriate data type. Print the marks of student if student name is given. **(06 Marks)**

OR

8 a. Define file. Explain the different modes of file with suitable examples. **(08 Marks)**

b. Explain the following file function with example.

i) fopen ( )
ii) fprintf ( )
iii) fscanf ( )
iv) fgets ( ) **(08 Marks)**

Module-5

9 a. What is pointer? Explain how pointer variable is declared and initialized. **(05 Marks)**

b. Explain any two preprocessor directives in C with example. **(06 Marks)**

c. Write a C program to swap two numbers using pointer concept. **(05 Marks)**

OR

10 a. What are primitive and non primitive data types? Explain. **(05 Marks)**

b. List the applications of stack and Queue data structure. **(05 Marks)**

c. Write a C program to find sum and mean of all elements in an array using pointer. **(06 Marks)**

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CBCS Scheme

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15EME14/24

First/Second Semester B.E. Degree Examination, June/July 2017

Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain petroleum based solid, liquid and gaseous fuels. **(08 Marks)**

b. Explain with a neat sketch the principle and operation of a typical windmill. **(08 Marks)**

OR

2 a. Explain with a neat sketch a Lancashire boiler. **(08 Marks)**

b. Define internal energy of steam and explain with reference to a T-H diagram formation of steam. **(08 Marks)**

Module-2

3 a. With a neat sketch, explain a Parason's reaction turbine. **(08 Marks)**

b. Explain with a neat sketch, principle and working of a pelton turbine. **(08 Marks)**

OR

4 a. Explain a 4-stroke C.I. engine with neat sketch and PV diagram. **(08 Marks)**

b. During a trial on single cylinder 4-stroke petrol engine the following readings were recorded:
Brake torque = 640 N-m
Cylinder diameter = 210 mm
Speed of the engine = 350 rpm
Length of stroke = 280 mm
Mean effective pressure = 6.5 bar
Consumption of petrol = 8.16 kg/hr
Calorific value of fuel = 42.7 MJ/kg
Determine:
i) Mechanical efficiency
ii) Indicated thermal efficiency
iii) Brake thermal efficiency
iv) Brake specific fuel consumption **(08 Marks)**

Module-3

5 a. What is turning? Explain with a neat sketch the taper turning by swiveling compound rest method. **(08 Marks)**

b. Explain with sketches the following machining operations:
i) End milling
ii) Slot milling **(08 Marks)**

OR

6 a. Explain the cylindrical coordinate configuration and spherical coordinate configuration of robots with neat sketches. **(08 Marks)**

b. What is automation? Explain fixed automation and programmable automation. **(08 Marks)**

Module-4

7 a. Explain in brief ferrous metals and alloys. **(08 Marks)**

b. What is composite material? Discuss its applications in aircrafts and automobiles. **(08 Marks)**

OR

8 a. Define soldering, brazing and welding. Also differentiate between soldering and brazing. **(08 Marks)**

b. Explain in brief an arc welding process with a neat sketch. **(08 Marks)**

Module-5

9 a. List out the properties of good refrigerant. **(08 Marks)**

b. Define the following (any four):

i) Refrigeration
ii) Refrigerant
iii) C.O.P. of a refrigerator
iv) Relative C.O.P.
v) Ton of refrigeration
vi) Ice making capacity
vii) Refrigerator
viii) Air conditioning **(08 Marks)**

OR

10 a. Explain the principle and working of vapour absorption refrigeration with a neat sketch. **(08 Marks)**

b. Explain with a sketch working of a room air-conditioner. **(08 Marks)**

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15ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2017
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. State and explain Ohm's Law with an illustration. Also list it's limitations. **(05 Marks)**

b. For the circuit shown in Fig. Q1(b), Obtain voltage between points X and Y. **(06 Marks)**

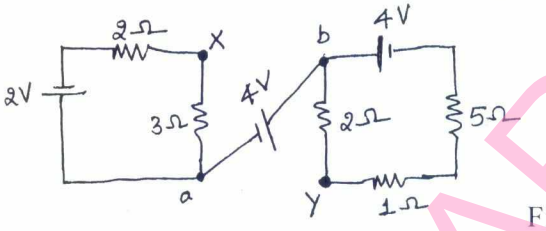

Fig. Q1(b)

c. Obtain relationship between self inductance of two coils, mutual inductance between the coils and co-efficient of coupling. **(05 Marks)**

OR

2 a. State and explain KCL and KVL with illustration for each. **(05 Marks)**

b. Coil A and B in a magnetic circuit have 600 and 500 turns respectively. A current of 8A in coil A produces a flux of 0.04Wb in it. If co-efficient of coupling is 0.2, calculate :
   i) Self inductance of coil A when coil B is open circuited
   ii) emf induced in coil B when flux changes from full value to zero in 0.02s
   iii) Mutual inductance. **(06 Marks)**

c. With illustrations, explain statically and dynamically induced emfs. **(05 Marks)**

Module-2

3 a. Explain the construction and principle of operation of dynamometer type wattmeter. **(05 Marks)**

b. Discuss about various characteristics of a DC series motor with neat diagrams. **(06 Marks)**

c. A 30kW, 300V, DC shunt Generator has armature resistance of 0.05Ω and field resistance of 100Ω. Calculate power developed by the armature when it delivers full output power. **(05 Marks)**

OR

4 a. Derive emf equation for a DC Generator. **(05 Marks)**

b. Explain the construction and principle of operation of a single phase induction type energy meter. **(06 Marks)**

c. A 4 pole, DC shunt motor takes 22.5A from 250V supply. The armature is wave wound with 300 conductors. The armature resistance is 0.5Ω and field resistance is 125Ω. If useful flux per pole is 0.02Wb ; calculate :
   i) Speed ii) Torque developed iii) Electrical power developed. **(05 Marks)**

Module-3

5 a. With a neat connection diagram and functional table, explain three way control of a lamp. **(05 Marks)**

b. An alternating voltage (80 + j60)V is applied to a circuit and the current flowing through it is (–4 + j10) A. Find the i) impedance of the circuit ii) phase angle iii) pf of the circuit iv) power consumed by the circuit. **(06 Marks)**

c. For the circuit shown Fig. Q5(c), Find ;
i) Current in each branch ii) Power factor of the circuit. **(05 Marks)**

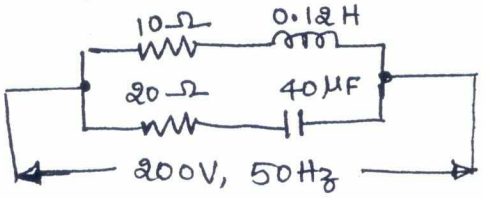

Fig. Q5(c)

OR

6 a. Show that the power consumed by a pure capacitor is zero. Draw the voltage, current and power waveforms. **(05 Marks)**
b. What is earthing? Explain any one type with neat diagram. **(06 Marks)**
c. A series RLC circuit with 100Ω, 25μF and 0.15H is connected across 220V, 50Hz supply calculate : i) impedance ii) current iii) p.f iv) voltage drops across inductor and capacitor. **(05 Marks)**

Module-4

7 a. Mention advantages of 3 phase system over 1 phase system. **(05 Marks)**
b. Three arms of a 3ϕ, delta connected load, each comprise of a coil having 25Ω resistance and 0.15H inductance in series with a capacitor of 120μF across 415V, 50Hz supply. Calculate line current, power factor and power consumed. **(06 Marks)**
c. A 3ϕ, 4 pole, 50Hz star connected alternator has 36 slots with 30 conductors per slot. The useful flux per pole is 0.05Wb. Find synchronous speed and line voltage on no-load. Assume winding factor of 0.96. **(05 Marks)**

OR

8 a. Mention the advantages of stationary armature of an alternator. **(05 Marks)**
b. Establish the relationship between line and phase voltages and currents in a 3ϕ star connected balanced circuit. Shown the vector diagram neatly. **(06 Marks)**
c. Calculate power, power factor and line current in a balanced 3ϕ star connected system drawing power from 440V supply in which two wattmeters connected indicate W_1 = 5kW and W_2 = 1.2kW. **(05 Marks)**

Module-5

9 a. Derive the condition for maximum efficiency of a transformer, **(05 Marks)**
b. Explain with neat vector diagrams, the concept of rotating magnetic field theory. **(06 Marks)**
c. Define slip speed and slip. What is the slip speed, slip and at what speed rotor runs if the frequency of the emf in the stator of a 4 pole, 3ϕ IM is 50Hz and in the rotor is 1.5Hz? **(05 Marks)**

OR

10 a. Derive emf equation of a transformer. **(05 Marks)**
b. With neat diagrams, explain construction of types of rotors of 3ϕ induction motor. **(06 Marks)**
c. A 10KVA, 1ϕ transformer has a primary winding of 300 turns and secondary winding of 750 turns, cross sectional area of core is 64cm^2. If primary voltage is 440V at 50Hz, find maximum flux density in the core, emf induced in secondary of transformer. At 0.8 lag p.f, calculate the efficiency of transformer if full load copper loss is 400W and iron-loss is 200W. **(05 Marks)**

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CBCS Scheme

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15ELN15/25

First/Second Semester B.E. Degree Examination, June/July 2017

Basic Electronics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain briefly the PN junction diode characteristics. **(06 Marks)**

b. Explain Zener diode voltage regulator circuit with no load and with load. **(06 Marks)**

c. Derive the relationship between α and β. Calculate the value of I_c for a transistor that has $\alpha = 0.98$ and $I_b = 200\ \mu A$. **(04 Marks)**

OR

2 a. Explain briefly the common emitter circuit and sketch the input and output characteristics. Also explain operating regions by indicating them on characteristics curve. **(06 Marks)**

b. With a neat circuit diagram and waveforms, explain the working of a half-wave rectifier. **(06 Marks)**

c. Explain briefly capacitor filter circuit. **(04 Marks)**

Module-2

3 a. What is a DC load line? Explain the voltage divider bias circuit. **(08 Marks)**

b. Mention and explain the characteristics of ideal operational amplifier. **(04 Marks)**

c. Derive the expression of integrator with circuit diagram. **(04 Marks)**

OR

4 a. With neat circuit and necessary equations, explain the voltage follower. **(06 Marks)**

b. Explain the base bias circuit. **(04 Marks)**

c. Explain briefly inverting and non-inverting operational amplifiers. **(06 Marks)**

Module-3

5 a. State and prove De-Morgan's theorem with truth table. **(06 Marks)**

b. Explain the basic gates AND, OR and NOT gates with truth tables. **(06 Marks)**

c. Explain the half-adder circuit. **(04 Marks)**

OR

6 a. Explain the full-adder circuit. **(06 Marks)**

b. Simplify the given Boolean equation $Y = (A + \overline{B})(CD + E)$ and realize using NAND gates only. **(04 Marks)**

c. Convert the following:

i) $(49.5)_{10} = (\quad ? \quad)_{16}$

ii) $(1062.403)_8 = (\quad ? \quad)_{10}$

iii) $(642.71)_8 = (\quad ? \quad)_2$ **(06 Marks)**

Module-4

7 a. What is R-S flip-flop? Explain its circuit diagram, logic symbol and truth table. **(08 Marks)**

b. Explain the architecture of 8051 microcontroller in detail. **(08 Marks)**

OR

8 a. Explain the gated R-S flip-flop and clocked R-S flip-flop. **(08 Marks)**

b. With the help of block diagram, explain the micro-controller based stepper motor control system. **(08 Marks)**

Module-5

9 a. Explain the construction of LVDT and its operation. **(06 Marks)**

b. Explain the frequency modulation with neat waveforms. **(06 Marks)**

c. Explain with diagram the AM detection (demodulation). **(04 Marks)**

OR

10 a. Explain the piezoelectric transducer and photoelectric transducer. **(06 Marks)**

b. Explain with block diagram elements of communication system. **(06 Marks)**

c. Compare AM and FM modulation. **(04 Marks)**

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CBCS Scheme

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Question Paper Version : B

First/Second Semester B.E Degree Examination, June/July 2017

Constitution of India, Professional Ethics & Human Rights

(COMMON TO ALL BRANCHES)

Time: 2 hrs.] [Max. Marks: 40

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the forty 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. A money bill passed by the Lok Sabha can be delayed by the Rajya Sabha for a maximum period of
   a) 14 days b) one month c) two month d) three month
2. How many times the president can return bill passed by the parliament for its consideration?
   a) once b) twice c) thrice d) never
3. Membership of legislative assembly can vary between
   a) 40-500 b) 60-500 c) 50-400 d) 60-300
4. Which among the following house cannot be dissolved but can be abolished?
   a) Legislative Assembly b) Lok Sabha
   c) Legislative Council d) Rajya Sabha
5. How many members retired in legislative council for every two years?
   a) 1/4 b) 1/3 c) 1/5 d) 1/6
6. The election commission consists of _____ members.
   a) 3 b) 4 c) 5 d) 6
7. Every party has to stop the election campaign before _____ of polling.
   a) 12 hours b) 24 hours c) 36 hours d) 48 hours
8. Voting age of citizens is changed from 21 to 18 years by _____ Constitutional Amendment Act.
   a) 7^{th} b) 42^{nd} c) 74^{th} d) 61^{st}
9. Human rights are
   a) local b) regional c) universal d) none of these

10. The town and city municipality members enjoy a term of _____ years.
a) 4 b) 6 c) 3 d) 5

11. Breakdown of Constitutional Machinery in a state is popularly known as
a) President rule b) National emergency
c) Financial emergency d) All of these

12. President can proclaim an emergency with the recommendation of the
a) Prime Minister b) Vice-President
c) LS d) Union Cabinet

13. Who has the power to pardon in case of capital punishment?
a) President b) Chief Justice of India
c) Prime Minister d) Governor

14. What is the maximum gap in months permissible between two sessions of parliament?
a) Three b) Four c) Six d) Twelve

15. Engineering ethics is a
a) natural ethics b) developing ethics
c) preventive ethics d) none of these

16. One of the impediments to responsibility is
a) Self-deception b) Rampant corruption at higher level
c) Interference by higher officers d) Interference by politicians

17. 'Good Works' means
a) responsible work
b) work above and beyond the call of duty
c) work involving high risk
d) superior work done with great care and skill

18. Copy right protects the expression of ideas but not the
a) predicting ideas b) deriving ideas
c) ideas themselves d) both a and b

19. One of the ways of reducing risk is
a) tight coupling b) complex interaction
c) normalization of deviance d) changing the working system

20. Conflict of interest may be
a) imaginary b) potential c) created d) false

21. The first meeting of the constituent assembly was held in
a) 1949 b) 1950 c) 1947 d) 1946

22. The Indian Constitution came into force on
a) 26th Nov 1949 b) 26th Nov 1945 c) 26th Jan 1950 d) 15th Aug 1947

23. How much time did the constituent assembly took to prepare the constitution of India?
a) 2Y, 11M, 18D b) 2Y, 10M, 18D c) 2Y, 11M, 08D d) 3Y, 10M, 18D

24. The Constitution of India is
a) an evolved constitution b) unwritten document
c) written and bulky document d) based on conventions

25. Dr. Rajendra Prasad was chairman of
a) Drafting Committee b) Constituent Assembly
c) Council of States d) None of these

26. The preamble is so far amended
a) once b) twice c) thrice d) 42 times

27. India is a Sovereign, Socialist, Secular, Democratic, Republic. In the Indian constitution, this expression occurs in
a) fundamental rights b) directive principles c) preamble d) none of these

28. The concept of fundamental right is borrowed from
a) UK b) USA c) Germany d) Russia

29. An arrested person must be produced before a magistrate within _____ hours of arrest.
a) 24 b) 12 c) 36 d) 48

30. Telephone tapping is a violation of
a) right to speech b) right to personal liberty
c) right to freedom d) none of these

31. Right to equality is guaranteed under the article.
a) 14 b) 15 c) 16 d) 17

32. Part IV of the constitution deals with
a) fundamental rights b) fundamental duties
c) preamble d) DPSP

33. Which among the following DPSP that has not been implemented so far
a) Separation of Judiciary from the executive
b) Organization of panchayats
c) Uniform civil code
d) Promotion of international peace and security

34. Fundamental duties are enshrined under _____ part of the constitution
a) II b) III c) IV d) IV A

35. Who is the first citizen of India?
a) The President b) The Vice-President
c) Prime Minister d) Governor

36. The upper house is called
a) Lok Sabha b) Rajya Sabha c) Vidhana Sabha d) None of these

37. The maximum strength of Lok Sabha is
a) 545 b) 575 c) 552 d) 590

38. Which of the state having highest members in Lok Sabha?
a) Andra Pradesh b) Karnataka c) Madhya Pradesh d) Uttar Pradesh

39. The speaker is elected by the member of _____.
a) Lok Sabha b) Rajya Sabha c) Prime Minister d) President

40. What is the age of retirement of the judges of the supreme court?
a) 58 years b) 60 years c) 62 years d) 65 years

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CBCS Scheme

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Question Paper Version : A

First/Second Semester B.E Degree Examination, June / July 2017
Environmental Studies
(COMMON TO ALL BRANCHES)

Time: 2 hrs.] [Max. Marks: 40

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the forty 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 French word which means to encircle or surround.
   a) Environ b) Oikor c) Geo d) Aqua

2. Which of the following component of the environment are effective transport of matter?
   a) Atmosphere and hydrosphere b) Atmosphere and Lithosphere
   c) Hydrosphere and Lithosphere d) Lithosphere and hydrosphere.

3. Which of the following is a biotic component of an ecosystem:
   a) Fungi b) Solar light c) Temperature d) Humidity

4. The sequence of eating and being eaten in an ecosystem is called,
   a) Food chain b) Carbon cycle c) Hydrological cycle d) None of these

5. Primary consumer is,
   a) Herbivores b) Carnivores c) Macro consumer d) Omni vores

6. The Major atmospheric gas layer in stratosphere is,
   a) Hydrogen b) Carbon dioxide c) Ozone d) Oxygen

7. A food web consists of,
   a) a portion of a food chain
   b) an organisms position in a food chain
   c) Interlocking of food chain
   d) a set of similar consumer

8. India has a world's largest share of which of the following:
   a) Manganese b) Mica c) Copper d) Diamond

9. Major purpose of most of the dams around the world is,
   a) Power generation b) Irrigation c) Drinking water supply d) Flood control

10. The Permissible range of pH for drinking water as per the Indian standard,
    a) 6 to 9 b) 6.5 to 7.5 c) 6 to 8.5 d) 6.5 to 8.5

11. Excess of fluorides in drinking water is likely to cause,
    a) Blue babies b) Fluorosis c) Taste and Odour d) Colour

12. The largest reservoir of nitrogen on our planet is,
    a) Ocean b) Atmosphere c) Biosphere d) Fossil fuels

13. Mining means,
    a) Conserve and Preserve minerals
    b) Check pollution due to mineral resource
    c) Extract minerals and ores
    d) None of these

14. E.I.A can be expanded as,
    a) Environment and Industrila act
    b) Environmental Impact activity
    c) Environmental Impact Assessment
    d) Environmentally important activity.

15. "Earth Day" is held every year on,
    a) June 5th b) November 23rd c) April 22nd d) May 16

16. Water logging is a phenomena in which,
    a) Crop patterns are rotated
    b) Soil root zone becomes saturated due to over irrigation,
    c) Erosion of soil
    d) None of these

17. Which of the following is considered as an alternate fuel?
    a) CNG b) Kerosine c) Coal d) Petrol

18. Wind Farms are located in,
    a) River basin b) Plain area c) Hilly area d) Valley area

19. Hydrogen energy can be tapped through,
    a) Heat pumps b) Fuel cells c) Photovoltaic cell d) Gasifier

20. With Minimum resource maximum energy can be created by,
    a) Solar radiation b) Wind c) Nuclear fuels d) Tidal waves

21. Nuclear fusion uses the following as a fuel,
    a) Carbon b) Helium c) Hydrogen d) Water

22. Biogas is gaseous fuel composed mainly of,
a) Methane and carbon dioxide
b) Methane and hydrogen sulphide
c) Methane and Carbon monoxide
d) None of these

23. Reduction in brightness of the famous Taj Mahal is due to,
a) Global warming b) Air pollution c) Ozone depletion d) Afforestation

24. Ozone layer thickness is measured in,
a) PPM b) PPB c) Decibels d) Dobson units

25. Bhopal gas tragedy caused due to leakage of,
a) Methyl Iso Cyanate b) Sulphur dioxide c) Hydrogen Sulphide d) Methane

26. Septic tank is,
a) An aerobic attached growth treatment system
b) An aerobic suspended growth biological treatment system
c) An aerobic attached growth biological treatment system.
d) An aerobic suspended growth treatment system.

27. Sound that is safest to the human ear should not exceed,
a) 45 Db b) 125 Db c) 70 Db d) 85 Db

28. Scientific means of M.S.W management involves,
a) Collection and transport
b) Segregation
c) Safe disposal
d) All of these

29. Cow dung can be used,
a) as manure
b) for production of Bio gas
c) as fuel
d) All of these

30. Biomedical waste can be disposed off by,
a) Incineration
b) Autoclaving and Land filling
c) Both (a) and (b)
d) None of these

31. The objectives of Integrated Child Development Services (ICDS) are,
a) Immunization
b) Health check up and referral services.
c) Pre-school non-formal education
d) All of these

32. The international protocol to protect the ozone layer is,
a) Montreal protocol
b) The Vienna protocol
c) Kyoto protocol
d) Cartagena protocol

33. Environmental (protection) act was enacted in the year,
a) 1986 b) 1992 c) 1984 d) 1974

34. The forest (conservation) act was enacted in the year,
a) 1986 b) 1974 c) 1994 d) 1972

35. The leader of Chipko movement is,
a) Sunderlal Bahuguna b) Medha Patkar c) Vandana Shiva d) Suresh Hebliker

36. Chernobyl Nuclear disaster occurred in the year,
a) 1984 b) 1985 c) 1986 d) 1987

37. The computer driven system that permits storing and retrieving environmental information,
a) GIS b) Digital information c) Information technology d) None of these

38. Bacteria that are commonly associated with root nodules are,
a) Rhizobium b) Bacillus c) Pseudomonas d) None of these

39. Earth's fresh water reserves are about,
a) 2.6% b) 26% c) 0.26% d) 1.6%

40. The Earth is believed to have come to existence some,
a) 3.5 billion years ago b) 4.5 billion years ago
c) 4.5 million years ago d) 5.5 million years ago

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CBCS Scheme

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15MAT21

Second Semester B.E. Degree Examination, June/July 2017
Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Solve : $\frac{d^2y}{dx^2} - 4y = \cosh(2x-1) + 3^x$. **(05 Marks)**

b. Solve : $(D^2 - 4D + 3)y = e^{2x}.\cos 3x$. **(05 Marks)**

c. Apply the method of undetermined coefficients to solve $y'' - 3y' + 2y = x^2 + e^x$. **(06 Marks)**

OR

2 a. Solve : $(D^4 - 1)y = 0$. **(05 Marks)**

b. Solve : $(D^2 - 4D + 4)y = 8(e^{2x} + \sin 2x)$. **(05 Marks)**

c. By the method of variation of parameters solve $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$. **(06 Marks)**

Module-2

3 a. Solve : $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$. **(05 Marks)**

b. Solve : $\frac{dy}{dx} - \frac{dx}{dy} = \frac{x}{y} - \frac{y}{x}$. **(05 Marks)**

c. Solve $(px - y)(py + x) = 2p$ by reducing it into the Clairauit's form by taking the substitution $X = x^2$, $Y = y^2$. **(06 Marks)**

OR

4 a. Solve : $(1+x^2)y'' + (1+x)y' + y = \sin\{\log(1+x)^2\}$. **(05 Marks)**

b. Obtain the general solution and the singular solution of the equation $p^2 + 4x^5p - 12x^4y = 0$. **(05 Marks)**

c. Show that the equation $xp^2 + px - py + 1 - y = 0$ is a Clairauit's equation. Hence obtain the general solution and the singular solution. **(06 Marks)**

Module-3

5 a. Form a partial differential equation by eliminating ϕ and ψ from the relation $z = x\phi(y) + y\psi(x)$. **(05 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x^2} - a^2 z = 0$ under the conditions $z = 0$ when $x = 0$ and $\frac{\partial z}{\partial x} = a\sin y$ when $x = 0$. **(05 Marks)**

c. Derive an expression for the one dimensional heat equation. **(06 Marks)**

OR

6 a. Form a partial differential equation by eliminating ϕ from $\phi(x + y + z, xy + z^2) = 0$. **(05 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ given that $\frac{\partial z}{\partial y} = -2\sin y$, when $x = 0$ and $z = 0$ when y is an odd multiple of $\frac{\pi}{2}$. **(05 Marks)**

c. Use the method of separation of variables to solve the wave equation $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$. **(06 Marks)**

Module-4

7 a. By changing the order of integration, evaluate $\int_0^a \int_y^a \frac{x\,dx\,dy}{x^2+y^2}$. **(05 Marks)**

b. Evaluate $\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} (x^2+y^2+z^2)\,dx\,dy\,dz$. **(05 Marks)**

c. Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$ using definition of $\Gamma(n)$. **(06 Marks)**

OR

8 a. Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\,dx\,dy$ by changing into polar coordinates. **(05 Marks)**

b. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \int_0^{\sqrt{a^2-x^2-y^2}} \frac{dz\,dy\,dx}{\sqrt{a^2-x^2-y^2-z^2}}$. **(05 Marks)**

c. Show that $\int_0^{\frac{\pi}{2}} \sqrt{\sin\theta}\,d\theta \cdot \int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} = \pi$. **(06 Marks)**

Module-5

9 a. Find the Laplace transform of,
$2^t + \frac{\cos 2t - \cos 3t}{t} + t\sin t$. **(05 Marks)**

b. A periodic function of period 2a is defined by, $f(t) = \begin{cases} E & \text{for } 0 \le t \le a \\ -E & \text{for } a < t \le 2a \end{cases}$ where E is a constant. Show that $L\{f(t)\} = \frac{E}{S}\text{Tanh}\left(\frac{aS}{2}\right)$. **(05 Marks)**

c. Find $L^{-1}\left\{\log\left[\frac{s^2+1}{s(s+1)}\right]\right\}$. **(06 Marks)**

OR

10 a. Express $f(t) = \begin{cases} \sin t, & 0 < t \le \frac{\pi}{2} \\ \cos t, & t > \frac{\pi}{2} \end{cases}$ in terms of unit step function and hence find its laplace transform. **(05 Marks)**

b. By using the convolution theorem find $L^{-1}\left\{\frac{1}{(s^2+a^2)^2}\right\}$. **(05 Marks)**

c. By using Laplace transforms, solve $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^{2t}$, $x(0) = 0$, $\frac{dx}{dt}(0) = -1$. **(06 Marks)**

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