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1K514CS004

14MAT11

**First Semester B.E. Degree Examination, Dec.2015/Jan.2016**  
**Engineering Mathematics – I**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting at least ONE question from each Part.**

**Part – 1**

- 1 a. If  $y = e^{ax} \sin(bx + c)$  then prove that  $y_n = (a^2 + b^2)^{\frac{n}{2}} e^{ax} \sin\left[ (bx + c) + n \tan^{-1}\left(\frac{b}{a}\right) \right]$ . (06 Marks)
- b. Show that the radius of curvature at any point of the cycloide  $x = a(\theta + \sin \theta)$ ;  $y = a(1 - \cos \theta)$  is  $4a \cos\left(\frac{\theta}{2}\right)$ . (07 Marks)
- c. Show that the two curves  $r = a(1 + \cos \theta)$  and  $r = a(1 - \cos \theta)$  cut each other orthogonally. (07 Marks)

OR

- 2 a. If  $x = \sin t$  and  $y = \cos pt$  then prove that  $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} + (p^2 - n^2)y_n = 0$ . (07 Marks)
- b. Show that the Pedal equation for the curve  $r^m = a^m \cos m\theta$  is  $Pa^m = r^{m+1}$  (06 Marks)
- c. Derive an expression for radius of curvature in polar form. (07 Marks)

**Part – 2**

- 3 a. If 'u' is a homogenous function of degree 'n' in the variable x and y, then prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = nu$ . (07 Marks)
- b. Using Maclaurin's series prove that,  
 $\sqrt{1 + \sin 2x} = 1 + x - \frac{x^2}{2} - \frac{x^3}{3} + \frac{x^4}{24} + \dots$  (06 Marks)
- c. If z is a function of x and y where  $x = e^u + e^{-v}$  and  $y = e^{-u} - e^v$ , then prove that  $\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y}$ . (07 Marks)

OR

- 4 a. If  $u = \sin^{-1}\left[\frac{x^2 + y^2}{x + y}\right]$  then prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$ . (07 Marks)
- b. Evaluate  $\lim_{x \rightarrow 0} \left[ \frac{a^x + b^x + c^x + d^x}{4} \right]^{\frac{1}{x}}$ . (06 Marks)
- c. If  $u = x + y + z$ ,  $uv = y + z$  and  $uvw = z$  then show that  $\frac{\partial(xyz)}{\partial(uvw)} = u^2v$ . (07 Marks)

**Part – 3**

- 5 a. A particle moves along the curve  $x = (1 - t^3)$ ,  $y = (1 + t^2)$ ,  $z = (2t - 5)$  determine its velocity and acceleration. Also find the components of velocity and acceleration at  $t = 1$  in the direction of  $2i + j + 2k$  (07 Marks)
- b. Using differentiation under integral sign evaluate  $\int_0^1 \frac{x^\alpha - 1}{\log x} dx$ ,  $\alpha \geq 0$  (06 Marks)
- c. Apply the general rules to trace the curve  $r = a(1 + \cos \theta)$ . (07 Marks)

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

OR

- 6 a. Apply the general rule to trace curve  $y^2(a-x) = x^2(a+x)$ ,  $a > 0$ . (07 Marks)
- b. Show that  $\vec{F} = (y^2 - z^2 + 3yz - 2x)\hat{i} + (3xz + 2xy)\hat{j} + (3xy - 2xz + 2z)\hat{k}$  is both solenoidal and irrotational. (06 Marks)
- c. Show that  $\text{div}(\text{curl}A) = 0$ . (07 Marks)

**Part - 4**

- 7 a. Obtain the reduction formula for  $\int \cos^n x dx$  where 'n' being the positive integer. (07 Marks)
- b. Solve  $(y \cos x + \sin y + y)dx + (\sin x + x \cos y + x)dy = 0$ . (06 Marks)
- c. Show that the family of curves  $\frac{x^2}{a^2 + \lambda} + \frac{y^2}{b^2 + \lambda} = 1$ , where  $\lambda$  is a parameter is self orthogonal. (07 Marks)

OR

- 8 a. Evaluate  $\int_0^{\frac{\pi}{4}} \cos^6 x \sin^6 x dx$ . (07 Marks)
- b. Solve  $e^y \left( \frac{dy}{dx} + 1 \right) = e^x$ . (06 Marks)
- c. A body originally at  $80^\circ\text{C}$  cools down to  $60^\circ\text{C}$  in 20 minutes. The temperature of air being  $40^\circ\text{C}$ . What will be the temperature of the body after 40 minutes from the original? (07 Marks)

**Part - 5**

- 9 a. Find the Rank of the matrix  $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 8 & 7 & 0 & 5 \end{bmatrix}$ . (07 Marks)
- b. Find the largest eigen value and the corresponding eigen vector of the given matrix 'A' by using the Rayleigh's power method. Take  $[1 \ 0 \ 0]^T$  as the initial eigen vector.  

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$$
 (06 Marks)
- c. Solve  $2x + y + 4z = 12$ ,  $4x + 11y - z = 33$  and  $8x - 3y + 2z = 20$  by using Gauss Elimination method. (07 Marks)

OR

- 10 a. Solve by LU decomposition method,  
 $3x + 2y + 7z = 4$   
 $2x + 3y + z = 5$   
 $3x + 4y + z = 7$  (07 Marks)
- b. Reduce the quadratic form  $3x^2 + 5y^2 + 3z^2 - 2y^2 + 2zx - 2xy$  the canonical form and specify the matrix of transformation. (06 Marks)
- c. Show that the transformation  $y_1 = 2x_1 + x_2 + x_3$ ,  $y_2 = x_1 + x_2 + 2x_3$ ,  $y_3 = x_1 - 2x_3$  is regular and also write down the inverse transformation. (07 Marks)

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14CHE12/22

**First/Second Semester B.E. Degree Examination, Dec.2015/Jan.2016**  
**Engineering Chemistry**

Time: 3 hrs.

Max. Marks: 100

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

**MODULE – 1**

- 1
  - a. Explain redox and gas electrodes with example. (05 Marks)
  - b. What are reference electrodes? Explain the construction and working of Ag-AgCl electrode. Mention any two applications. (05 Marks)
  - c. Explain the following battery characteristics :
    - i) Voltage ii) Energy efficiency iii) Shelf life. (05 Marks)
  - d. Discuss the construction and working of Li-MnO<sub>2</sub> battery. (05 Marks)
- 2
  - a. Discuss the construction and working of Zinc – Air battery. (05 Marks)
  - b. What are Fuel cells? Give the classification of fuel cells on the basis of temperature and electrolyte. (05 Marks)
  - c. What are Electrode concentration cells? Give example. These spontaneous galvanic cell Tin | Tin ion(0.02m) || Tin ion (0.06m) | Tin develops an emf of 0.0141V at 298K. Calculate the valency of tin. (05 Marks)
  - d. Explain the construction and working of glass electrode. (05 Marks)

**MODULE – 2**

- 3
  - a. Discuss the rusting of iron based on electro – chemical theory of corrosion. (05 Marks)
  - b. How does the following factors affect the rate of corrosion?
    - i) Nature of metal ii) Anodic and Cathodic polarization. (05 Marks)
  - c. Define Metal finishing. Mention any four technological importance of metal finishing. (05 Marks)
  - d. Write a note on : i) Polarization and ii) Overvoltage. (05 Marks)
- 4
  - a. Explain the influence of the following in electro deposition :
    - i) Current density and ii) pH. (05 Marks)
  - b. Discuss the electroplating of chromium with reactions. (05 Marks)
  - c. What is Stress Corrosion? Explain caustic embrittlement in boilers. (05 Marks)
  - d. What is Metallic coating? Explain the process of galvanization. (05 Marks)

**MODULE – 3**

- 5
  - a. 0.7g of chemical fuel containing 5% hydrogen, when burnt in a bomb calorimeter raises the temperature of water from 291K to 295K. The weight of water is 1.3kg and water equivalent of calorimeter is 0.35kg. The specific heat of water is 4.187kJ kg<sup>-1</sup> k<sup>-1</sup>. The latent of steam is 2454kJ/kg. Calculate GCV and NCV of fuel. (05 Marks)
  - b. Explain the terms 'Octane' and 'Cetane' numbers. (05 Marks)
  - c. Discuss the diffusion technique for p- and n- doping of silicon. (05 Marks)
  - d. Explain the design of solar module, panel and arrays. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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- 6 a. Explain the construction and working of Photovoltaic cell. (05 Marks)  
b. Describe the physical and chemical properties of silicon relevant to photovoltaics. (05 Marks)  
c. What is reforming of petrol? Mention any three reactions involved in reforming process. (05 Marks)  
d. What is Knocking? Explain the mechanism of Knocking in IC engine. (05 Marks)

**MODULE – 4**

- 7 a. What is Polymerization? Describe addition and condensation polymerization with example. (05 Marks)  
b. Explain three radical mechanism for addition polymerization taking Vinyl chloride as an example. (05 Marks)  
c. Write the synthesis and applications of the following polymers :  
i) polyurethane and ii) Polycarbonate. (05 Marks)  
d. What are Polymer composites? Explain the synthesis of carbon fibre. (05 Marks)
- 8 a. What is Glass transition temperature? How is it influenced by  
i) Molecular mass and ii) Stereo regularity. (05 Marks)  
b. Discuss Structure – Property relationship of polymers with respect to  
i) Elasticity and ii) Chemical resistivity. (05 Marks)  
c. A polymer sample containing 50, 100 and 150 molecules having molar mass 1000, 2000 and 3000 respectively. Calculate the number average and weight average molecular mass of polymer. (05 Marks)  
d. What are Adhesives? Give the synthesis and application of epoxy resin. (05 Marks)

**MODULE – 5**

- 9 a. Explain boiler corrosion due to oxygen, carbon dioxide and magnesium chloride with reactions. (05 Marks)  
b. What is COD? Explain the estimation of COD of waste water. (05 Marks)  
c. Write a note on nanowires and nanorods. (05 Marks)  
d. What are Dendrimers? How are they prepared? (05 Marks)
- 10 a. What are Nanomaterials? Explain the size dependent properties of nanomaterials. (05 Marks)  
b. Discuss the synthesis of nanomaterial by chemical vapour condensation method. (05 Marks)  
c. 50 ml of sewage water sample was diluted to 500ml and equal volumes were taken in two BOD bottles. During blank titration 100ml of the sample required 9.8ml of 0.025N  $\text{Na}_2\text{S}_2\text{O}_3$  solution. Another 100ml of incubated sample required 6.9ml of 0.025N  $\text{Na}_2\text{S}_2\text{O}_3$  solution. Calculate BOD of sewage water sample. (05 Marks)  
d. What is Desalination? Explain desalination of sea water by reverse osmosis with neat labeled diagram. (05 Marks)

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14PHY12/22

**First/Second Semester B.E. Degree Examination, Dec.2015/Jan.2016**  
**Engineering Physics**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions, selecting atleast ONE full question from each part.**

**2. Physical constants : Velocity of light,  $C = 3 \times 10^8$  m/s ;  
 Plank's constant,  $h = 6.625 \times 10^{-34}$  J.S ; Mass of electrons,  
 $m = 9.11 \times 10^{-31}$  kg ; Boltzmann's constant,  $K = 1.38 \times 10^{-23}$  J/K.  
 Avogadro number,  $N_A = 6.02 \times 10^{26}$  /K mole.**

**PART - 1**

1.
  - a. Define phase velocity and group velocity. Derive a relation between the two. (05 Marks)
  - b. What is the physical interpretation of wave function? Explain the nature of eigen values and eigen functions. (06 Marks)
  - c. Explain Wein's law and Rayleigh - Jean's law. Discuss their drawbacks. (06 Marks)
  - d. Calculate the de - Broglie wavelength associated with an electron carrying energy 2000 eV. (03 Marks)
  
2.
  - a. State Heisenberg's uncertainty principle. Using uncertainty principle. Explain the non - existence of electron in the nucleus. (07 Marks)
  - b. Using time independent Schrodinger's wave equation, obtain the expression for the normalized wave function for a particle in one dimensional potential well of infinite height. (09 Marks)
  - c. The speed of electron is measured to within an uncertainty of  $2.2 \times 10^4$  m/s in one - dimension. What is the minimum width required by the electron to be confined in an atom? (04 Marks)

**PART - 2**

3.
  - a. Explain the probability of occupation of various energy state by electron at  $T = 0$  K and  $T > 0$  K on the basis of Fermi factor. (06 Marks)
  - b. Define Hall Effect and Hall Voltage. Derive an expression for Hall coefficient. (06 Marks)
  - c. Explain BCS theory of Super conductivity. (04 Marks)
  - d. Find the relaxation time of conduction electrons in a metal of resistivity  $1.54 \times 10^{-8}$   $\Omega$ m, if the metal has  $5.8 \times 10^{28}$  electrons/ $m^3$ . (04 Marks)
  
4.
  - a. Discuss different types of super conductors. (04 Marks)
  - b. Explain Fermi - energy and Fermi - factor. (06 Marks)
  - c. Explain failure of Classical free electron theory. (06 Marks)
  - d. Calculate the Fermi velocity for the free electrons in gold. Given  $E_F = 5.53$ eV. (04 Marks)

**PART – 3**

- 5 a. Derive an expression for energy density in terms of Einstein's coefficients. (08 Marks)  
 b. Explain the construction and working of carbon dioxide laser device. (08 Marks)  
 c. The attenuation of light in an optical fiber is 3.6 dB/km. What fraction of its initial intensity remains after i) 1 km ii) after 3 km. (04 Marks)
- 6 a. What is Total internal reflection? Derive an expression for acceptance angle of an optical fiber. (08 Marks)  
 b. Discuss different types of optical fibres. (06 Marks)  
 c. An optical fiber has a numerical aperture of 0.32. The refractive index of cladding is 1.48. Calculate the refractive index of the core, the acceptance angle of the fiber and the fractional index change. (06 Marks)

**PART – 4**

- 7 a. Obtain the expression for inter planar spacing of a cubic crystal. (05 Marks)  
 b. Calculate the atomic packing factor for SC, FCC and BCC lattices. (06 Marks)  
 c. Write a note on Perovskite structure. (06 Marks)  
 d. A sodium chloride crystal is used as a diffraction grating with X – rays. For the  $d_{111}$  spacing of the chloride ions the angle of diffraction  $2\theta$  is  $27.5^\circ$ . If the lattice constant of the crystal is 0.563nm, what is the wavelength of X – rays? (03 Marks)
- 8 a. What is Bragg's law? Explain how Bragg's spectrometer is used for determination of interplanar spacing in a crystal. (08 Marks)  
 b. Discuss the principle and working of Liquid Crystal Display. (08 Marks)  
 c. Draw (100), (110), (011) and (111) planes in a Simple cubic crystal. (04 Marks)

**PART – 5**

- 9 a. Distinguish acoustic, subsonic and supersonic waves. (04 Marks)  
 b. Explain the preparation of nano structure using Sol – Gel method. (06 Marks)  
 c. Write a note on Carbon Nanotubes. (06 Marks)  
 d. What are Shock waves? Mention few applications of Shock wave. (04 Marks)
- 10 a. Explain the principle, construction and working of Reddy Shock tube. (08 Marks)  
 b. Explain the preparation of nano structures using Top – Down approach method. Mention any two properties of nano materials. (06 Marks)  
 c. Explain the construction and working of Scanning Electron Microscope. (06 Marks)

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- 8 a. Differentiate between STRUCTURES and UNIONS. (05 Marks)  
 b. Explain the various MODES in which a FILE can be created successfully. (05 Marks)  
 c. Given 2 university information files "studentname.txt" and "usn.txt" that contains students Name and USN respectively. Write a program to create a new file called "output.txt" and copy the contents of files "studentname.txt" and "usn.txt" into output file in the sequence shown below : (10 Marks)

Student Name	USN
Name - 1	USN - 1
Name - 2	USN - 2
.	.
.	.
.	.
.	.

**PART - 5**

- 9 a. Define a POINTER. Explain how pointer variable is declared and initialized. (06 Marks)  
 b. What are primitive and non - primitive data types? Give examples. (06 Marks)  
 c. Write a program using pointers to compute sum, mean and standard deviation of all elements stored in an array of "n" real numbers. (08 Marks)
- 10 a. Explain any 2 pre - processor directives in 'C' language. (05 Marks)  
 b. What is a STACK? Explain its applications. (05 Marks)  
 c. What is a QUEUE? Explain with example. (05 Marks)  
 d. Write a program to swap 2 numbers using call - by - reference method. (05 Marks)

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14CIV13/23

**First/Second Semester B.E. Degree Examination, Dec.2015/Jan.2016**  
**Elements of Civil Engineering and Engineering Mechanics**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE questions, selecting ONE full question from each Module.**

MODULE – 1

- 1 a. Briefly explain the scope of any three fields of Civil Engineering. (10 Marks)  
 b. Write the classification of roads and comparison of flexible and rigid pavements. (10 Marks)
- 2 a. Define Force and write the characteristics of forces with examples. (08 Marks)  
 b. Determine angle  $\theta$  ( $0 \leq \theta \leq 180^\circ$ ) for the force  $F = 200\text{kN}$  shown in fig. Q2(b), so that it produces : i) Maximum moment about 'A' and ii) Minimum moment about 'A'. Determine maximum and minimum moments. (08 Marks)  
 c. State and explain principle of transmissibility of a force. (04 Marks)

MODULE – 2

- 3 a. State and prove the parallelogram of forces. (08 Marks)  
 b. Define Resolution of a force with diagram. (04 Marks)  
 c. A barge is pulled by two tug boats as shown in fig.Q3(c). If the resultant of the forces exerted by the tug boats is 5kN force directed along the axis of the barge. Determine the tension in each of the ropes knowing that  $\alpha = 45^\circ$ . (08 Marks)
- 4 a. Define Moments and write the analytical conditions of equilibrium for a coplanar non concurrent force system. (05 Marks)  
 b. Force system shown in fig.Q4(b) has a resultant of 2kN acting up along Y – axis. Compute the force 'F' and its direction ' $\theta$ ' with the horizontal, to give this resultant. (07 Marks)  
 c. Determine the resultant of forces acting on cross section of dam shown in fig.Q4(c) and locate its intersection with the base AB. For good design, this intersection should occur within the middle third of the base. Does it? (08 Marks)

MODULE – 3

- 5 a. Determine the values of  $W_1$  and  $W_2$  shown in fig.Q5(a). So that the part BC of the string is horizontal. Calculate the tension in the parts AB, BC, CD and DE. Also calculate the pressure on the frictionless pulley at D. (10 Marks)  
 b. The cylinders P and Q weigh 20kN and 10kN. The corresponding diameters are 2.8m and 1.6m and are shown in fig.Q5(b). Determine the reactions of A, B, C and D. (10 Marks)
- 6 a. Define Equilibrium and Equilibrant, with neat diagram. (04 Marks)  
 b. Explain : i) Coefficient of friction ii) Angle of Repose iii) Cone of friction, with neat diagrams. (06 Marks)  
 c. Two blocks are placed as shown in fig.Q6(c). Weight of block A is 5kN and of block B is 4kN. The coefficient of friction between all surfaces in contact is 0.2. Find the effort required to start moving block B and also the tension in the cable. (10 Marks)

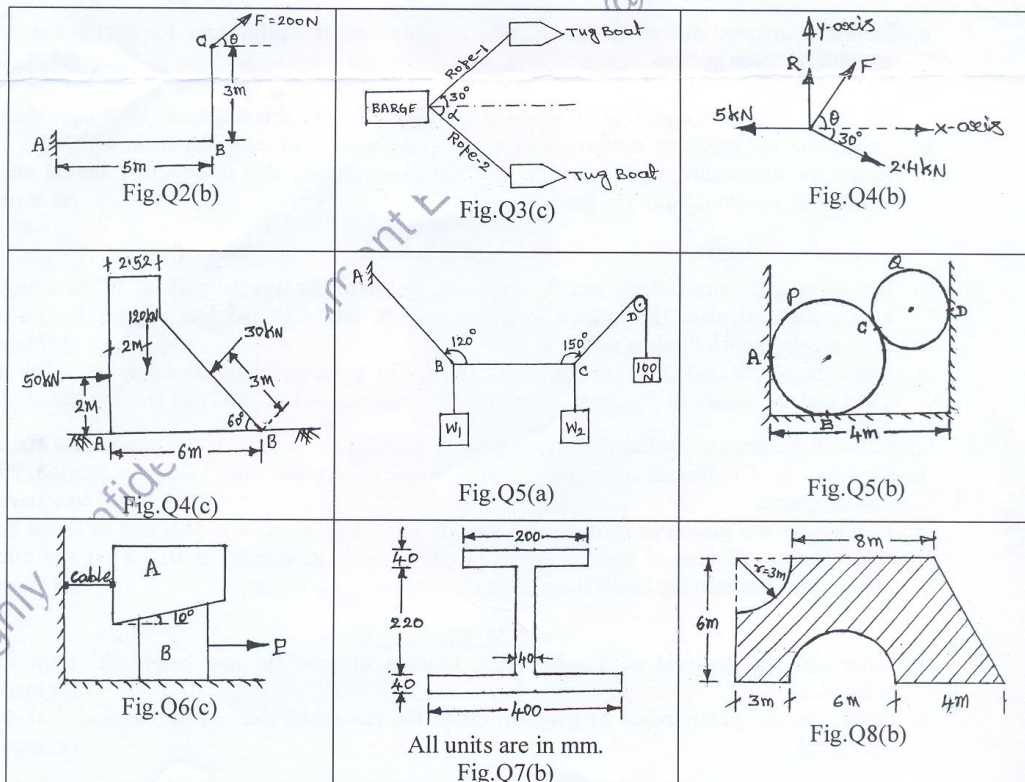
MODULE – 4

- 7 a. Determine the centroid of a right angle triangle of base 'b' and height 'h' from first principles. (08 Marks)  
 b. Determine the polar radius of gyration about the centroidal axes of the section shown in fig. Q7(b). (12 Marks)

- 8 a. Derive the expression for the M.I of a semicircular lamina of radius (r) about its centroidal axis parallel to the diameter. (08 Marks)  
 b. Determine the centroid of lamina shown in fig.Q8(b) and mark the centroid. (12 Marks)

**MODULE - 5**

- 9 a. Define i) Rectilinear motion ii) Curvilinear motion with example. (06 Marks)  
 b. Explain the following with sketch :  
 i) Angle of projection ii) Time of flight iii) Range. (06 Marks)  
 c. A stone is thrown vertically upwards and returns to the earth in 10S. What was its initial velocity and how high did it go? (08 Marks)
- 10 a. Derive an expression for maximum height of a projectile on a horizontal plane. (08 Marks)  
 b. A cricket ball thrown by a player from a height of 2.0m above the horizontal ground at an angle of  $30^\circ$  to the horizontal and with a velocity of 12m/s. The ball hits the wicket at a height of 0.6m above the ground. How far is the player from the wicket? (12 Marks)



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14EME14/24

**First/Second Semester B.E. Degree Examination, Dec.2015 / Jan.2016**  
**Elements of Mechanical Engineering**

Time: 3 hrs.

Max. Marks:100

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

**Module – 1**

- 1 a. Name three renewable and non-renewable energy sources and compare them for advantages and disadvantages. (08 Marks)
- b. Define calorific value of fuel. Explain higher calorific value and lower calorific value. (06 Marks)
- c. With a neat sketch, explain application of solar flat plate collector. (06 Marks)
- 2 a. Define the following terms in relation to steam:
  - i) Dryness fraction.
  - ii) Latent heat.
  - iii) Degree of super heat.
  - iv) Saturation temperature (08 Marks)
- b. Differentiate between water tube Boiler and Fire tube Boiler. (06 Marks)
- c. List the boiler mountings and accessories and also mention their uses. (06 Marks)

**Module – 2**

- 3 a. Sketch and explain working of reaction steam turbine. (08 Marks)
- b. Describe the working principle of a closed cycle gas turbine with neat sketch. (07 Marks)
- c. How water turbines are classified? (05 Marks)
- 4 a. Explain with neat sketch construction and working of 4-stroke diesel engine with the help of theoretical P-V diagram. (10 Marks)
- b. A Gas Engine working on 4-stroke cycle has a cylinder diameter 300 mm and stroke length of 500 mm is running at 220 rpm. Its mechanical efficiency is 80% when the mean effective pressure is 0.65 MPa. Find i) Indicated power ii) Brake power iii) Friction power. (10 Marks)

**Module – 3**

- 5 a. With a neat sketch, explain the following lathe operations:
  - i) Facing
  - ii) Cylindrical turning.
  - iii) Knurling.
  - iv) Thread cutting. (08 Marks)
- b. Define automation. Discuss the different types of automation. (06 Marks)
- c. Differentiate between:
  - i) Drilling and Boring.
  - ii) Counter boring and counter sinking. (06 Marks)
- 6 a. Explain any two types of Robot-configuration. (08 Marks)
- b. What are NC and CNC machines? Mention the difference between them. (06 Marks)
- c. What are the different operations commonly performed on milling machine? Explain any two. (06 Marks)

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

**Module – 4**

- 7 a. State the composition and applications of Carbon steels used in Engineering applications. (07 Marks)  
b. Define composite material. How composites are classified? (07 Marks)  
c. With neat sketches, explain different types of Flames used in Gas welding. (06 Marks)
- 8 a. What is welding? Explain electric arc welding with sketch. (07 Marks)  
b. Differentiate between soldering, brazing and welding. (07 Marks)  
c. Explain the advantages and limitations of composites. (06 Marks)

**Module – 5**

- 9 a. What are the desirable properties of Good refrigerants? (06 Marks)  
b. With suitable sketch, explain working of vapour compression refrigeration. (08 Marks)  
c. Define the following:  
i) Ton of refrigeration.  
ii) Refrigeration effect.  
iii) C.O.P. (06 Marks)
- 10 a. What is principle of refrigeration? Name essential parts of refrigerator, and briefly explain their functions. (06 Marks)  
b. Explain the construction and working of room air conditioner. (08 Marks)  
c. Explain the various applications of air conditioning. (06 Marks)

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14ELN15/25

First/Second Semester B.E. Degree Examination, Dec.2015 / Jan.2016

**Basic Electronics**

Time: 3 hrs.

Max. Marks:100

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

**Module – 1**

- 1 a. Draw and explain the V-I characteristics of a silicon diode. (08 Marks)
- b. What is a rectifier? With a neat circuit diagram and waveforms, explain the working of full wave rectifier. (08 Marks)
- c. A full wave rectifier with a load of 1 K $\Omega$ . The ac voltage applied to the diode is 200-0-200 V, if diode resistance is neglected. Calculate:
  - i) Average dc current; (04 Marks)
  - ii) Average dc voltage. (04 Marks)
- 2 a. Draw and explain the input and output characteristics of common emitter configuration. (08 Marks)
- b. Explain full wave rectifier with capacitor filter with necessary waveforms. (07 Marks)
- c. In common emitter transistor circuit if  $\beta = 100$  and  $I_B = 50 \mu A$ , compute the values of  $I_C$ ,  $I_E$  and  $\alpha$ . (05 Marks)

**Module – 2**

- 3 a. With a neat circuit diagram, explain the voltage divider bias circuit by giving its exact analysis. (08 Marks)
- b. For the base bias circuit for npn transistor, find  $I_B$ ,  $I_C$  and  $V_{CE}$  if  $R_C = 2.2 K\Omega$ ,  $R_B = 470 K\Omega$ ,  $V_{CC} = 18 V$ ,  $h_{fe} = 100$ . Draw the dc load line and Q point. (08 Marks)
- c. What is op-amp? List the ideal characteristics of an op-amp. (04 Marks)
- 4 a. Define for an op-amp (i) CMRR, (ii) Slew rate, (iii) PSRR. (06 Marks)
- b. Show how an op-amp can be used as integrator. Derive an expression for its output. (06 Marks)
- c. For the circuit shown in Fig.Q4(c). Calculate the output voltage.

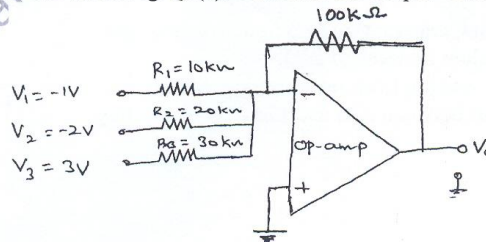


Fig.Q4(c)

(04 Marks)

- d. What is voltage follower? Explain. (04 Marks)

**Module – 3**

- 5 a. Convert :
  - i)  $(35.45)_{10} = ( )_2$
  - ii)  $(475.25)_8 = ( )_{10}$
  - iii)  $(3FD)_{16} = ( )_2$

(06 Marks)

- b. State and prove Demorgan's theorems. (06 Marks)
- c. Show that:
- i)  $\overline{ABC} + B + \overline{BD} + \overline{ABD} + \overline{AC} = B + C$
- ii)  $\overline{AB} + \overline{A} + AB = 0$
- iii)  $AB + A(B+C) + B(B+C) = B + AC$  (06 Marks)
- d. What are universal gates? (02 Marks)
- 6 a. Realize two input EX-OR gate using only NAND gates. (05 Marks)
- b. Design full adder and implement it. (07 Marks)
- c. Subtract  $(111001)_2$  from  $(101011)_2$  using 2's complement method. (04 Marks)
- d. Realize OR gate using diodes and explain. (04 Marks)

**Module – 4**

- 7 a. Define flip flop. Explain R-S flip flop. (05 Marks)
- b. With neat block diagram, explain architecture of 8085 microprocessor. (10 Marks)
- c. List the difference between microprocessor and microcontroller. (05 Marks)
- 8 a. What is transducer? Distinguish between active and passive transducer. (05 Marks)
- b. With a neat sketch, explain construction and working of LVDT. (07 Marks)
- c. Explain the working of photo voltaic transducer. (08 Marks)

**Module – 5**

- 9 a. What is modulation? What is the need of modulation? (05 Marks)
- b. A 500 W, 1 MHz carrier is amplitude modulated with a sinusoidal signal of 1 kHz. The depth of modulation is 60%. Calculate the bandwidth, power in the sidebands and the total power transmitted. (07 Marks)
- c. Define AM. Draw the AM signal and its spectrum. Derive the necessary expressions for AM. (08 Marks)
- 10 a. With a block diagram, explain typical cellular mobile unit. (05 Marks)
- b. What is ISDN? Explain services of ISDN. (06 Marks)
- c. Explain advantages and applications of optical fibers. (05 Marks)
- d. Give the comparison between AM and FM. (04 Marks)

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14ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2015/Jan.2016

**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. Compare electric circuit and magnetic circuit. (05 Marks)  
 b. For the circuit shown in Fig. Q1(b), the total power dissipated is 488W. Calculate the current flowing in each resistance and pd between A and B. (05 Marks)

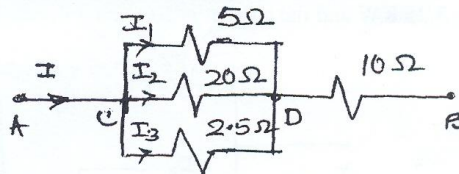


Fig. Q1(b)

- c. Derive an expression for the energy stored in the magnetic field. (05 Marks)  
 d. A coil of 200 turns of wire is wound on a magnetic circuit of reluctance 2000 AT/wb. If a current of 1A flowing in the coil is reversed in 10 sec, find the average emf induced in coil. (05 Marks)

**OR**

- 2 a. Define the following :  
 i) Statically induced emf  
 ii) Dynamically induced emf  
 iii) Co-efficient of coupling. Give example for (i) and (ii) and expression for (iii). (06 Marks)  
 b. A conductor of length 0.5m situated in and at right angles to a uniform magnetic field of flux density 1 Wb/m<sup>2</sup> moves with a velocity of 40 m/s. Calculate the emf induced in the conductor. What will be the emf induced if the conductor moves at an angle 60° to the field. (04 Marks)  
 c. State and explain Kirchoff's laws. (04 Marks)  
 d. For the Fig. Q2(d) calculate the current in 2Ω resistor. (06 Marks)

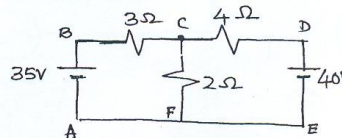


Fig. Q2(d)

**Module-2**

- 3 a. With a neat diagram showing important parts of DC machine and explain important features of the parts shown. (08 Marks)  
 b. A 230V DC shunt motor takes a no load current of 3A and runs at 1100 rpm. If the full load current is 41A, find the speed on full load. Assume armature resistance 0.25Ω and shunt field resistance 230Ω. (06 Marks)  
 c. With neat sketch, explain the working of dynamometer type wattmeter. (06 Marks)

OR

- 4 a. With a neat diagram, explain the principle of operation of single phase induction type energy meter. (06 Marks)
- b. Derive the emf equation of a DC generator. (06 Marks)
- c. A 440 V Dc shunt motor takes an armature current of 20 A and runs at 500 rpm. The armature resistance is  $0.6 \Omega$ . If the flux is reduced by 30% and the torque is increased by 40%, calculate the new value of armature current and speed. (08 Marks)

**Module-3**

- 5 a. Define the following with reference to AC quantities : i) Instantaneous value ii) Frequency iii) Time period iv) Form factor v) Peak factor. (05 Marks)
- b. When 220 V AC supply is applied across AB terminals for the circuit shown in Fig. 5(b), the input is 3.25 KW and the current is 20A. Find the current through  $Z_3$ . (09 Marks)

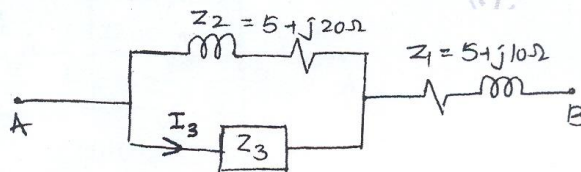


Fig. Q5(b)

- c. Explain the working of three-way control of lamp with the help of switching table. (06 Marks)

OR

- 6 a. With a neat diagram explain the working of RCCB. (06 Marks)
- b. Prove that a pure capacitor do not consume any power. (06 Marks)
- c. A coil of p.f. 0.6 is in series with a  $100 \mu\text{F}$  capacitor. When connected to a 50Hz supply the p.d. across the coil is the p.d. across the capacitor. Find the resistance and inductance of the coil for the circuit shown in Fig. Q6(c). (08 Marks)

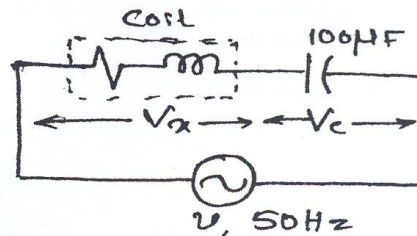


Fig. Q6(c)

**Module-4**

- 7 a. List the advantages of 3-ph system over 1-ph system. (06 Marks)
- b. Three  $50 \Omega$  resistors are connected in star across 400V 3-ph supply :  
 i) Find phase current, line current and power drawn from supply  
 ii) What would be the above values if one of the resistors were disconnected? (06 Marks)
- c. What are the advantages of rotating field type alternator? (03 Marks)
- d. A 2-pole, 3-ph alternator running at 3000 rpm has 42 armature slots with 2 conductors in each slot. Calculate the flux/pole required to generate a phase voltage of 1100 V. Assume  $k_d = 0.97$ , and full pitch winding. (05 Marks)



OR

- 8 a. Derive an emf equation of alternator. (06 Marks)  
 b. A 12 pole 500 rpm star connected alternator has 48 slots with 15 conductors/slot the flux/pole is 0.02 Wb and is distributed sinusoidally. The winding factor is 0.97 calculate the line emf. (04 Marks)  
 c. Derive a relation between line current and phase current in case of 3 – ph Delta connected load. (06 Marks)  
 d. Three similar coils are connected in delta across a 3–ph supply. The two wattmeters connected to measure the input power indicate 12 KW and 7KW. Calculate :  
 i) Power input  
 ii) Power factor of the load. (04 Marks)

Module-5

- 9 a. Explain various losses in transformer. How these losses can be minimized? (05 Marks)  
 b. A 600 KVA transformer has an efficiency of 92% both at full load unity p.f. and half load 0.9 p.f. Determine its efficiency at 75% of full load and 0.9 p.f. (07 Marks)  
 c. List the differences between squirrel cage and wound rotor induction motor. (04 Marks)  
 d. A 4–pole, 3–ph IM is supplied from 50 Hz supply. Find its synchronous speed. On full load its speed is observed to be 1410 rpm. Calculate its full load slip. (04 Marks)

OR

- 10 a. Explain the necessity of starters in 3–ph induction motor. (04 Marks)  
 b. A 3–ph IM with 4–pole is supplied from an alternator having 6–poles and running at 1000 rpm. Calculate :  
 i) The synchronous speed of 1M  
 ii) Its speed when slip is 0.04  
 iii) Frequency of the rotor emf when the speed is 600 rpm (06 Marks)  
 c. Define the voltage regulation of a transformer. What is its importance? (04 Marks)  
 d. A 500 KVA transformer has  $N_1 : N_2 = 300 : 20$ . The primary winding is connected to a 2200 V, 50 Hz supply calculate :  
 i) Secondary voltage on no load  
 ii) Approximate values of primary and secondary currents on full load  
 iii) The maximum value of the flux. (06 Marks)

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Question Paper Version : C

First/Second Semester B.E Degree Examination, Dec.2015/Jan.2016

**Constitution of India and Professional Ethics****(COMMON TO ALL BRANCHES)**

Time: 2 hrs.]

[Max. Marks: 50

**INSTRUCTIONS TO THE CANDIDATES**

1. Answer all the fifty 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.

- 
1. Conflict of interest exists for an engineer when he is subject to
    - a) Misusing the truth
    - b) Threat
    - c) Loyalties
    - d) Professional harassment
  2. Fundamental rights are classified into how many Heads
    - a) 10
    - b) 8
    - c) 5
    - d) 6
  3. The Sole channel of communication between the Cabinet and the President is
    - a) Home Minister
    - b) Prime Minister
    - c) Speaker of Lok Sabha
    - d) Vice - President
  4. Dispute regarding the election of the President can be heard at
    - a) Original Jurisdiction of Supreme court
    - b) Original Jurisdiction of High court
    - c) Parliament
    - d) National Commission
  5. Begar means
    - a) Begging
    - b) Free service by force
    - c) Payable service
    - d) None of these
  6. Mr. Sachin Tendulkar is
    - a) President of Indian Cricket Board
    - b) Member of Rajya Sabha
    - c) Member of Lok Sabha
    - d) None of these
  7. Karnataka State has
    - a) Bi - Cameral legislature
    - b) Uni Cameral Legislature
    - c) Tri Cameral legislature
    - d) Poli Cameral legislature
  8. How many members of Vidhana Parishad are nominated by the Governor
    - a) 1/6<sup>th</sup>
    - b) 1/4<sup>th</sup>
    - c) 1/3<sup>rd</sup>
    - d) 1/10<sup>th</sup>

9. Minimalist view means  
 a) Minimum view  
 b) Limited view  
 c) Stay out of Trouble  
 d) None of these
10. Which Article of the Indian Constitution deals with abolition of Titles  
 a) Article 15      b) Article 14      c) Article 17      d) Article 18
11. President of India is  
 a) Real executive  
 b) Head of the Government  
 c) Head of cabinet  
 d) Nominal Executive
12. The Chancellor of University is  
 a) Chief Minister of a State  
 b) Governor of concerned State  
 c) Education Minister of that State  
 d) Director of Collegiate Education.
13. The total number of members in National Commission for Scheduled caste and Scheduled tribe are  
 a) Ten      b) Eight      c) Five      d) Seven
14. The Chief Justice and other Judges of the Supreme court holds office until they attain the age of  
 a) 62 yrs      b) 65 yrs      c) 70 yrs      d) for life time
15. Engineering Ethics is  
 a) Developing Ethics  
 b) Preventive Ethics  
 c) Natural Ethics  
 d) Scientifically developed Ethics
16. Voting age of citizen is changed from 21 to 18 years by which constitutional amendment  
 a) 42<sup>nd</sup>      b) 61<sup>st</sup>      c) 56<sup>th</sup>      d) 76<sup>th</sup>
17. President can resign to his office by giving his resignation to  
 a) Chief Justice of India  
 b) Prime Minister  
 c) Vice President  
 d) Speaker of Loka Sabha
18. Right to life guaranteed under Article 21 is applicable to  
 a) All persons  
 b) Only citizens  
 c) Convicts  
 d) Persons residing within in India
19. Which state in India has its own constitution  
 a) Kerala      b) Jammu & Kashmir      c) Assam      d) Bihar
20. The total number of Elected members in Rajya Sabha  
 a) 238      b) 250      c) 545      d) 300
21. India became Republic on  
 a) 26-01-1950      b) 26-11-1949      c) 15-08-1947      d) 01-11-1956
22. The word Fraternity means  
 a) Equality      b) Clash      c) Brotherhood      d) Enemy
23. National Emergency is dealt in  
 a) Art - 370      b) Art - 360      c) Art - 226      d) Art - 352
24. Now the Total number of fundamental duties is  
 a) 12      b) 11      c) 8      d) 10
25. The Articles dealing Right to equality are  
 a) Articles – 14 to 18  
 b) Articles – 12 to 35  
 c) Articles – 36 to 51  
 d) Articles – 52 to 78



39. During National emergency the following Article cannot be suspended  
a) Art - 17                      b) Art - 18                      c) Art - 19                      d) Art - 20
40. India has which system of Government  
a) Presidential                      b) Monarchical                      c) Parliamentary                      d) Autocratic
41. Ego Centric Tendency means  
a) Superiority complex                      b) Arrogance  
c) Interpreting situation from limited perspective                      d) Habit of condemning others
42. Who said Article 32 is Heart and Soul of the Indian Constitution  
a) Jawaharlal Nehru                      b) Sardar Vallabhai Patel  
c) Lal Bahadur Shastri                      d) Dr. B.R. Ambedkar
43. Writ of Quo – Warranto means  
a) Who you are                      b) By what Authority  
c) To command                      d) None of these
44. The term of the Election commission  
a) 3 years                      b) 2 years  
c) 6 years or till he attain the age of 65 years                      d) 5 years or till he attains the age of 62 years
45. India is secular that means  
a) India views all religions equally                      b) India is a Anti religion  
c) India promotes new religion                      d) India does not believe in religion
46. Cooking means  
a) Retaining the result which fit the theory                      b) Making deceptive statements  
c) Boiling under pressure  
d) Misleading the public about the quality of the product.
47. 74<sup>th</sup> Amendment of the constitution refers to  
a) Rural local bodies                      b) Urban local bodies  
c) Right to property                      d) Defection
48. Reprieve means  
a) Postponing the punishment                      b) Temporary suspension of the sentence  
c) Changing the punishment                      d) Reducing the amount of punishment.
49. Intellectual property is protected by  
a) Storing in computers                      b) Security personnel  
c) Patents trademarks and copy rights Act                      d) Company documentation
50. Uniform civil code for all citizens is  
a) Directive principles                      b) Fundamental Rights  
c) Fundamental duties                      d) None of the these

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14MAT21

**Second Semester B.E. Degree Examination, Dec.2015/Jan.2016**  
**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  $y'' + 4y' - 12y = e^{2x} - 3\sin 2x$ . (06 Marks)  
 b. By the method of undetermined coefficients solve  $\frac{d^2y}{dx^2} + y = 2 \cos x$ . (07 Marks)  
 c. Solve by the method of variation of parameters  $y'' + 4y = \tan 2x$ . (07 Marks)

**OR**

- 2 a. Solve  $\frac{d^4y}{dx^4} + m^4y = 0$ . (06 Marks)  
 b. Solve  $(D^2 + 7D + 12)y = \cos hx$ . (07 Marks)  
 c. By the method of variation of parameters, solve  $y'' + y = x \sin x$ . (07 Marks)

**Module-2**

- 3 a. Solve the simultaneous equations  $\frac{dx}{dt} + 2y + \sin t = 0$ ,  $\frac{dy}{dt} - 2x - \cos t = 0$  given that  $x = 0$  and  $y = 1$  when  $t = 0$ . (07 Marks)  
 b. Solve  $x^2 y'' - xy' + 2y = x \sin(\log x)$ . (07 Marks)  
 c. Solve  $\frac{dy}{dx} - \frac{dx}{dy} = \frac{x}{y} - \frac{y}{x}$ . (06 Marks)

**OR**

- 4 a. Solve  $(x + a)^2 y'' - 4(x + a)y' + 6y = x$ . (07 Marks)  
 b. Solve  $p = \tan\left(x - \frac{p}{1+p^2}\right)$ . (07 Marks)  
 c. Find the general and the singular solution of the equation  $y = px + p^3$ . (06 Marks)

**Module-3**

- 5 a. Form the Partial Differential Equation of  $z = y f(x) + x g(y)$ , where  $f$  and  $g$  are arbitrary functions. (07 Marks)  
 b. Derive one dimensional heat equation. (07 Marks)  
 c. Evaluate  $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$  by changing into polar co-ordinates. (06 Marks)

**OR**

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

- 6 a. Solve  $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ , for which  $\frac{\partial z}{\partial y} = -2 \sin y$  when  $x = 0$  and  $z = 0$ , when  $y$  is an odd multiple of  $\pi/2$ . (07 Marks)
- b. Evaluate  $\iint_R xy dx dy$ , where  $R$  is the region bounded by  $x$  - axis, the ordinate  $x = 2a$  and the parabola  $x^2 = 4ay$ . (07 Marks)
- c. Evaluate  $\int_{-c}^c \int_{-b}^b \int_{-a}^a (x^2 + y^2 + z^2) dz dy dx$ . (06 Marks)

**Module-4**

- 7 a. Define Gamma function and Beta function. Prove that  $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$ . (07 Marks)
- b. Express the vector  $\vec{F} = z\hat{i} - 2x\hat{j} + y\hat{k}$  in cylindrical co - ordinates. (06 Marks)
- c. Find the volume common to the cylinders  $x^2 + y^2 = a^2$  and  $x^2 + z^2 = a^2$ . (07 Marks)

OR

- 8 a. Prove that  $\beta(m, n) = \frac{\Gamma(m) \Gamma(n)}{\Gamma(m+n)}$ . (07 Marks)
- b. Show that the area between the parabolas  $y^2 = 4ax$  and  $x^2 = 4ay$  is  $\frac{16}{3} a^2$ . (06 Marks)
- c. Prove that the cylindrical co-ordinate system is orthogonal. (07 Marks)

**Module-5**

- 9 a. Find  $L\{e^{-2t} \sin 3t + e^t t \cos t\}$ . (07 Marks)
- b. Find the inverse Laplace transform of  $\frac{4s+5}{(s-1)^2(s+2)}$ . (06 Marks)
- c. Solve  $y'' + 6y' + 9y = 12t^2 e^{-3t}$  by Laplace transform method with  $y(0) = 0 = y'(0)$ . (07 Marks)

OR

- 10 a. Express  $f(t) = \begin{cases} \cos t, & 0 < t \leq \pi \\ 1, & \pi < t \leq 2\pi \\ \sin t, & t > 2\pi \end{cases}$  in terms of unit step function and hence find its Laplace transform. (07 Marks)
- b. Solve by Laplace transform  $y'' + 6y' + 9y = 12t^2 e^{-3t}$  with  $y(0) = 0 = y'(0)$ . (06 Marks)
- c. Find  $L\left\{\frac{\cos at - \cos bt}{t}\right\}$ . (07 Marks)

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