

**(Revised)**

[Time: **THREE Hours**]

[Max. Marks: **80**]

“Please check whether you have got the right question paper.”

**N.B**

- i) Q.No.1 and Q.No.6 are compulsory
- ii) Attempt any two other questions from the remaining questions of each section
- iii) Assume suitable data wherever necessary

**SECTION A**

- Q.1 Attempt any five. 10
- i) Two vector's are represented by  
 $A = 2ax + 2ay$   
 $B = 3ax + 4ay - 2az$   
Find  $\bar{A} \times \bar{B}$
  - ii) Give the expression's of or differential surface area's in cylindrical coordinate system
  - iii) Relate the rectangular co-ordinates (x, y, z) of point P to its cylindrical co-ordinates ( $\rho, \phi, z$ )
  - iv) State coulomb's Law
  - v) Define the term electric potential and potential difference
  - vi) A charge of  $2\mu c$  located at the center of sphere of radius 5cm. what is the flux passing through the sphere
  - vii) State gauss Law
  - viii) Define the term gradient
- Q.2 a) Transform  $\bar{A} = 4ax - 2ay - 4az$  to cylindrical co-ordinates at the point (2, 3, 5) 07  
b) Derive the expression for electric field intensity due to line charge located along z axis of infinite extend 08
- Q.3 a) What do you mean by divergence Give the physical significance of divergence 07  
b) Find the divergence of D at the specified point if  $D = 4\rho z \sin\phi a\rho + 2\rho z \cos\phi a\phi + 2\rho^2 \sin\phi az c/m^2$  at  $P(1, \pi/2, 2)$  08
- Q.4 a) Define the point form of continuity equation of current 07  
b) The vector current density is given as  $J = 10^4(\sin 2x e^{-2y} ax + \cos 2x e^{-2y} ay) KA/m^2$  08
  - i) Find the total current crossing the plane  $y = 1$  in the ay direction in the region  $0 < x < 1, 0 < z < 3$
  - ii) Find the total current leaving the region  $0 < x, y < 1, 2 < z < 3$
- Q.5 a) Explain the term gradient and show that  $E = - \text{grad } V$  07  
b) For the point (6,  $60^\circ$ , 4) in cylindrical co – ordinate and the potential field  $V = 10 (\rho + 1)z^2 \cos \phi$  in free space find at point P, i) V, ii) E iii)  $\frac{dV}{dN}$  iv) D 08
- SECTION B**
- Q.6 Attempt any five 10
- i) State ampere's circuital law
  - ii) What are the properties of perfect metallic conductor
  - iii) What do you mean by magnetic dipole moment
  - iv) Define self and mutual inductance
  - v) Write the maxwell's equations in differential form
  - vi) Define polarization in dielectric
  - vii) Define vector magnetic potential
  - viii) What do you mean by capacitance .write the expression of capacitance for parallel plate capacitor

- Q.7 a) For a steady magnetic field show that  $\nabla \times H = J$  07  
 b) Find  $\Delta \times G$  in cylindrical co- ordinate at  $P (2, 30^\circ, 3)$  if  $G = \rho\phi z \text{ az}$  08
- Q.8 a) Define the boundary conditions at the interface between two different magnetic material 07  
 b) Evaluate closed line integral of H about a rectangular path  $P_1(2, 3, 4)$  to  $P_2(4, 3, 4)$  to  $P_3(4, 3, 1)$  to  $P_4(2, 3, 1)$  to  $P_1$  given  $H = 3zax - 2x^3az \text{ A/m}$  08
- Q.9 a) For a time varying field show that  $\nabla \times E = -\frac{\partial B}{\partial t}$  06  
 b) Evaluate both sides of stokes theorem for the field  $H = 6xy \text{ ax} - 3y^2 \text{ ay} \text{ A/m}$  and the rectangular path around the region  $2 \leq x \leq 5, -1 \leq y \leq 1, z = 0$  let the positive direction of ds be az 09
- Q.10 Attempt any three 15  
 i) Explain the term magnetic dipole moment and magnetization  
 ii) Explain the nature of dielectric material  
 iii) State and explain vector magnetic potential  
 iv) Explain uniqueness theorem