

Total No. of Questions :6]

SEAT No. :

**P78**

**Oct. -16/BE/Insem. - 133**

[Total No. of Pages :2

**B.E. (Electrical)**

**ELECTRO MAGNETIC FIELDS**

**(2012 Pattern) (Semester - I) (Elective - II) (403144 B)**

*Time : 1 Hour]*

*[Max. Marks :30*

*Instructions to the candidates:*

- 1) *Attempt Q.1, or Q.2, Q.3 or Q.4, Q.5 or Q.6.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate marks.*
- 4) *Use of logarithmic tables slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data if necessary.*

**Q1) a) Determine: [6]**

- i) Gradient of  $U = x^2y + xyz$ .
  - ii) Divergence of  $Q = \rho \sin \phi a_\rho + \rho^2 z a_\phi + z \cos \phi a_z$
  - iii) Curl of the field  $P = x^2yz a_x + xz a_z$
- b) Derive an expression for electric flux density D due to a point charge at origin in free space using Gauss's law. [4]

OR

**Q2) a) Define electric dipole. Derive an expression for potential V due to electric dipole. [6]**

- b) An electric dipole of  $100 a_z$  pC.m is located at the origin. Find V & E at point (0,0,10). [4]

**Q3) a) Derive an expression for the capacitance of two wire line. [6]**

- b) Calculate the numerical value for V and  $\rho_v$  at point P(1,2,3) in free space if  $V = 4yz/(x^2+1)$  [4]

OR

**P.T.O.**

- Q4)** a) Given the vector current density  $J = 10\rho^2z a\rho - 4\rho \cos^2 \phi a\phi$  mA/m<sup>2</sup>. Determine the current density at P( $\rho=3, \phi=30^\circ, z=2$ ). Determine the total current flowing outward through the circular band  $\rho=3, 0 < \phi < 2\pi, 2 < z < 2.8$ . [6]
- b) Derive the boundary conditions for the tangential components of electric field intensity at an interface between two dielectrics. [4]

- Q5)** a) State and prove Ampere's Circuital law. [6]
- b) Derive an expression for vector magnetic potential. [4]

OR

- Q6)** a) A current distribution gives rise to vector magnetic potential  $A = x^2y ax + y^2x ay - 4xyz az$  Wb/m. Calculate B at (-1,2,5). Calculate the flux through the surface defined by  $z=1, 0 \leq x \leq 1, -1 \leq y \leq 4$ . [6]
- b) Explain the physical significance of curl. [4]

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