Total No. of Questions :6]

SEAT No. :

P78

[Total No. of Pages :2

Oct. -16/BE/Insem. - 133
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 = $\rho\sin\varphi\, a\rho+\rho^2 z\, a\varphi+z\cos\varphi\, az$

iii) Curl of the field P = $x^2yz\ ax+xz\ az$

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 az 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 ρ 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 $J = 10\rho^2 z\, a\rho - 4\rho \cos^2 \varphi\, a\varphi$ mA/m^2. Determine the current density at P($\rho=3, \varphi=30^0, z=2$). Determine the total current flowing outward through the circular band $\rho=3$, $0 < \varphi < 2\pi$, $2 < z < 2.8$. **[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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