R – 480

Seat No.	

T.E. (Electrical) (Semester – V) Examination, 2009
ELECTROMAGNETICS
(New Course)

Day and Date : Tuesday, 24-11-2009 Total Marks : 100
Time : 10.30 a.m. to 1.30 p.m.

Instructions : *1) Solve **any three** questions from Section I and Section II.*
*2) Assume suitable data **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) For a uniform charge density ρ_v c/ m^3, distributed in a sphere of radius 'a' centered at the origin find the expression. $\bar{E}$ everywhere. 8

b) Find total charge inside each of indicated

a) $\rho_v = 10ze^{-0.1x}\sin \pi y; -1 \le x \le 2; 0 \le y \le 1, 3 \le z \le 3.6$

b) $\rho_v = \dfrac{3\pi \sin\theta \cos^2\phi}{2r^2\left(r^2+1\right)}$, universe

c) $\rho_v = 4xyz^2, 0 \le \rho \le 2, 0 \le \phi \le \pi/2, 0 \le z \le 3.$ 8

2. a) Define electrostatic potential and obtain a relation between electric field intensity and electric potential. 8

b) If $V = -x^2y^2z^3$ volts, find :

i) E ii) $\dfrac{dV}{dN}$

iii) $\hat{a}_n$ iv) ρ_v at, P(4, –2, 5). 8

P.T.O.

3. a) Derive the expressions for capacitance due to co-axial cable of inner radius 'a' and outer radius 'b' and Length 'L'. 8

   b) Two conducting spherical shells have radii of a = 2 cm and b = 5 cm. The interior is a perfect dielectric for which $\varepsilon_R = 10$. (a) Find C. (b) A portion of the dieletric is now removed so that

   $\varepsilon_R = 1, 0 < \theta < \frac{\pi}{6}$, and $\varepsilon_R = 10, \frac{\pi}{6} < \theta < \pi$. Find C. 8

4. a) State Gauss law and prove that div $\overline{D} = \rho_V$ and hence obtain Poissons equation. 10

   b) State and prove the boundary conditions satisfied by static electric field at an interface between a dielectric and perfect conductor. 8

SECTION – II

5. a) State Ampere's law of force and use the same to find the expression for the magnetic field due to a current element. 8

   b) Given the field be $\overline{H} = 6r\sin\theta\hat{a}_r + 18r\sin\theta\cos\phi\hat{a}_\phi$ evaluate both sides of Stoke's theorem for the portion of the cone $\theta = 0.1\pi$ bounded by $r = 2, r = 4$, $\varphi = 0$ and $\phi = 0.3\pi$. Let the direction of ds be $+\hat{a}_\theta$. 8

6. a) State and explain Biot Savart law. 8

   b) A 6 m. long straight filamentary conductor carrying a current of 4 amp is placed along positive z-axis with its end at origin. Find out the magnetic field intensity at point P(0, 3, 3). 8

7. a) Write down the Maxwell's equations in their point form and integral form. State the meaning of each equation in static field. 8

   b) A conductor of length 2.5 m located at z = 0, x = 4 m carries a current of 12 amp in the $\hat{a}_y$ direction. Find the magnetic flux in the region if the force on the conductor is 1.2×10^{-2}N in the direction $\frac{-\hat{a}_x + \hat{a}_z}{\sqrt{2}}$. 8

8. a) Explain wave equations for conductors in terms of $\overline{B}, \overline{H}, \overline{E}, \overline{D}$. 8

   b) What is mean by stub ? Explain single stub and double stub matching. 10