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BIEE-005

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

00566

Term-End Examination

June, 2014

BIEE-005 : ELECTROMAGNETIC THEORY

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions of the following.*

1. A charge Q coulomb is placed at the origin of a co-ordinate system. Prove that the charge enclosed by a sphere of radius 'a' centered at the origin is Q coulombs, using Gauss's Law. *10*

2. Derive the boundary conditions for conductor-free space boundary. *10*

3. Using the co-ordinate system named, give the vector at point P(2, –1, –3) that extends to Q (1, 3, 4) : *2+4+4=10*

(a) Cartesian

(b) Cylindrical

(c) Spherical

4. State Ampere's circuital law and derive expression for $\bar{H}$ at any point due to uniform surface current density $\bar{K}$ on an infinite plane. *10*

5. Enlist the Maxwell's Equation for time varying field in point form and integral form along with the law from which they are derived. *10*

6. Derive equation for wave motion in perfect dielectric. *10*

7. A infinitely long uniform line charge is located at y = 3, z = 5. If P_L = 30 nC/m, find $\bar{E}$ at (i) origin and (ii) $P_B(0, 6, 1)$. *10*

8. At an operating radian frequency of 500 M rad/s, typical circuit values for a certain transmission line are : R = 0·2 Ω/m, L = 0·25 μH/m, G = 10 μS/m, and C = 100 pF/m. Find *10*

   (a) α

   (b) β

   (c) λ

   (d) v_p

   (e) Z_0

9. State True or False : *2×5=10*

(a) Cross product of two vectors $\bar{A}$ and $\bar{B}$ is $\bar{A} \times \bar{B} = |\bar{A}||\bar{B}| \cos\theta\, \bar{a}_N$

(b) $\bar{a}_x . \bar{a}_r = \sin\theta \sin\phi$

(c) $\psi = \oint_S \bar{D}_s . d\bar{S} = Q$ is the statement of Gauss's Law.

(d) Divergence theorem relates a triple integration throughout some volume to a double integration over the surface of that volume.

(e) No work is involved in moving a unit charge around an equipotential surface.

10. Write short notes on any ***two*** : *5×2=10*

(a) Stokes' Theorem

(b) S.W.R. (Standing Wave Ratio)

(c) Divergence Theorem