No. of Printed Pages : 3

BIEE-005

00611

B.Tech. IN ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

December, 2013

BIEE-005 : ELECTROMAGNETIC THEORY

Time : 3 hours *Maximum Marks : 70*

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

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1. Derive the expression for Electric Field Intensity due to a sheet of charge with uniform charge density $\rho_s c/m^2$ on infinite plane. **10**

2 Derive the boundary conditions for perfect dielectric materials. **10**

3. Given the vector field, $\overline{G} = 2x^2y\ \bar{a}_x - 2\ (z-x)\ \bar{a}_y + 3xyz\ \bar{a}_z$, find : **10**

(a) $\overline{G}$ at P (2, −3, 4)

(b) a unit vector in the direction of $\overline{G}$ at P

(c) the scalar equation of the surface on which $|\overline{G}| = 100$

(d) the y-co-ordinate of Q $(-3,\ y,\ 5)$ if $|\overline{G}_Q| = 100$ and $y > 0$;

(e) the distance between P & Q

4. State Ampere's Circuital Law and derive expression for $\bar{H}$ at any point due to a co-axial cable. **10**

5. Given the field $\bar{H} = 6r \sin\phi \, \bar{a}r + 18r \sin\phi \cos\phi \, \bar{a}\phi$, evaluate both sides of Stoke's Theorem for the portion of the cone $\theta = 0.1\pi$ bounded by $r = 2$, $r = 4$, $\phi = 0$ and $\phi = 0.3\pi$. Let the direction of $d\bar{s}$ be $+ \bar{a}_\theta$. **10**

6. Derive the equation for wave motion in Lossy dielectric. **10**

7. (a) The vector $\bar{R}_{AB}$ extends from A (1,2,3) to B. If the length of $\bar{R}_{AB}$ is 10 units and its direction is given by **6**

$\bar{a} = 0.6 \, \bar{a}_x + 0.64 \, \bar{a}_y + 0.48 \, \bar{a}_z$, find the coordinates of B.

(b) In free space, let $Q_1 = 10nC$ be at $P_1(0, -4, 0)$ and $Q_2 = 20$ nC be at $P_2(0, 0, 4)$ Find $\bar{E}$ at the origin. **4**

8. A lossless transmission line is 80 cm long and operates at a frequency of 60 MHz. The line parameters are $L = 0.50$ $\mu H/m$ and $C = 200$ pF/m. Find the characteristic impedance, the phase constant, the velocity on the line, and the input impedance for $Z_L = 100\Omega$ **10**

9. State True or False : **2x5=10**

(a) Dot product of two vectors $\overline{A}$ and $\overline{B}$ is $\overline{A}.\overline{B} = |\overline{A}|\,|\overline{B}|\,\sin\theta$.

(b) $\bar{a}_x\ \bar{a}_e = \sin\phi$

(c) Gauss's Law is applicable to any kind of surface.

(d) The equipotential surfaces in the potential field of a point charge are sphere's centered at the point charge.

(e) $\bar{J} = \sigma\,\bar{E}$ is called the Point Form of Ohm's Law.

10. Write short notes on **any two**. **5x2=10**

(a) Divergence Theorem

(b) Biot Savart Law

(c) Smith Chart