No. of Printed Pages : 3 **BIEE-009**

B.TECH. IN ELECTRICAL ENGINEERING (BTELVI)

00372

Term-End Examination

December, 2011

BIEE-009 : APPLIED ELECTROMAGNETICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any five** questions. All questions carry **equal** marks.*

1. (a) Define electric dipole and dipole moment. Five equal point charges of $Q = 20 \times 10^{-9}C$ are placed at $x = 2, 3, 4, 5$ and 6 cm calculate the potential a origine. 7

(b) Explain the concept of electric field and derive expression for the electric field due to surface charge. 7

2. (a) Define electric displacement vector $(\overline{D})$. 7

The thickness of dielectric between parallel plates of condenser is 5mm. Dielectric constant is 3. Electric field in the dielectric is $10^6 V/m$. Calculate the surface charge

density on the condenser plate, electric displacement, polarisation. Surface charge density on the dielectric and energy density in the dielectric.

(b) Derive the expression of equation of continuity. Explain convection and conduction current density. 7

3. (a) What is capacitor ? Derive expression for capacitance of a spherical capacitor. 7

(b) Find the current distribution producing following field distribution using Ampere's law. 7

$$H = \begin{cases} J_0 r^2 \hat{a}\phi & 0 < r < a \\ J_0 \frac{a^3}{r} \hat{a}\phi & a < r < b \\ 0 & b < r < 0 \end{cases}$$

4. (a) State and explain Biot-Savart's law find $\vec{B}$ at r distance from a infinite current carrying wire. 7

(b) State and prove poynting theorem. Also give the physical interpretation of $\vec{E} \times \vec{H}$. 7

5. (a) Determine the amplitude of the reflected and Transmitted $\overline{E}$ and $\overline{H}$ at the interface shown in fig. 5a. If $E_i = 1.5 \times 10^{-3}$ V/m in region 1, in which 7

$\varepsilon_{r_1} = 8.5$, $\mu_{r_1} = 1$, $\sigma_1 = 0$.

Region 2 is free space. Assume normal incidence

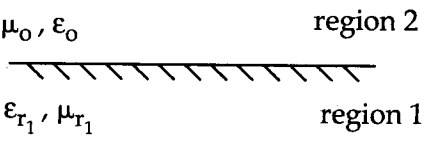

fig. 5a

(b) Derive the transmission line equation. 7

6. (a) An open wire transmission line has $R = 4.5$ kΩ, $L = 0.15$ mH, $G = 60$mmho, $C = 12$ nF. Operating frequency = 6 MHz and Transmission line is 300m. Find propagation constant, characteristic impedance and velocity of propagation. 7

(b) Explain SWR and Reflection Co-efficient in reference to EM wave. 7

7. Write the shor tnote on the following (*any two*) : $7 \times 2 = 14$

(a) Gauss's law of electrostatic

(b) Electric field polarisation

(c) Maxwell's equation

(d) Reflection coefficient