S.E. (sem. IV) – CBGS – EXTC 02/06/2015

Wave Theory & Propagation

Q.P. Code : 3618

(3 Hours) **[Total Marks : 80**

N.B.: (1) Questions No. **1** is compulsory.
(2) From remaining **five** questions solve any **three.**
(3) Use suitable data, whenever **required.**

1. (a) Give significance of boundary conditions for electric field. **20**
(b) Can you use CRO to measure the ratio of charge & mass of electron?
(c) Give behaviour of wave for normal incidence in dielectric media.
(d) Why do we need numerical techinques to solve field problems.

2. (a) Explain plane earth reflection on horizontally polarized & vertically polarized wave. **10**

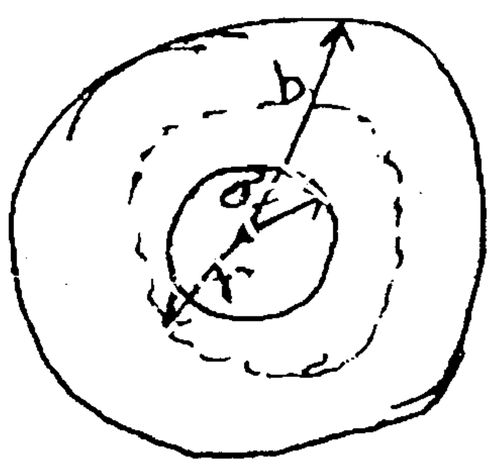
(b) Derive relation between MUF & Skip distance. **10**

3. (a) In non-magnetic medium **10**

$$\bar{E} = 4\sin\left[2\pi \times 10^7 t - 0.8x\right]\bar{a}_z \text{ V/meter. Find}$$

(i) ε_r ;η
(ii) The time average power carried by the wave.
(iii) The total power crossing 100 cm^2 of plane $2x + y = 5$

(b) Determine potential at 2.8cm from the center of co axial cable as shown in figure 1 by using FEM. There is no free charge between inner & outer sheaths of coaxial cable. **10**



a = 1.5 cm.
b = 4.4 cm
r = 2.8 cm

Figure 1

4. (a) Explain parallel & perpendicular polarization of wave. **8**

(b) A uniform plane wave in air with $\bar{E} = 8\cos\left[\omega t - 4x.3z\right]\bar{a}_y$ volt / meter is incident on dielectric slab [$z \geq 0$] with $\mu r = 1$, $\varepsilon_r = 2.5$, $\sigma = 0$ **6**
Find
(i) Polarization of wave.
(ii) The Angle of incidence

(c) Explain Ray path & critical frequency. **6**

5. (a) What is the advantage of using a traingular mesh in the FEM 5

(b) Give the solution of wave equation for free space. 5

(c) Solve Laplace's equation $\overline{V}^2 V = 0$ 10
$0 \leq x \leq 1$; $0 \leq y \leq 1$ with
$V(x, 1) = 45\, x\, (1 - x)$;
$V(x, 0) = V(0, y) = V(1, y) = 0$
Assume mesh size as 0.5

6. (a) Write maxwell's equation in a) point form b) integral form 10
Explain the significance of each equation.

(b) State poynting theorem. What is poynting vector? 5

(c) What is a magnetic dipole? How does a magnetic dipole differ from electric dipole. 5
