Total No. of Questions : 10] SEAT No. :

P1320 [Total No. of Pages : 3

[4858] - 1055
T.E. (Electronics)
ELECTROMAGNETICS & WAVE PROPOGATION
(Semester - I) (2012 Pattern) (End Semester)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.No. 1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8. and Q.No.9 or Q.No.10.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever required.***
4) ***Use of electronic pocket calculater and smith chart is allowed.***
5) ***Assume Suitable data, if necessary.***

Q1) a) Derive expression for electric field intensity due line charge using Gauss law **[6]**

b) Derive expression for capacitance of parallel plate capacitance. **[4]**

OR

Q2) a) Derive Boundary condition for electric field at interface between conductor and free space. **[6]**

b) A dipole having moment $\bar{P} = 3a\bar{x} - 5a\bar{y} + 10a\bar{z}$ nCm is located at Q(1,2,-4) in free space find potential (V) at point P(2,3,4) **[4]**

Q3) a) Explain the continuity equation. **[4]**

b) Plane Z = 0 and Z = 4 carry a current $\bar{K} = -10a\bar{x}$ A/m and $\bar{K} = 10a\bar{x}$ A/m respectively. Find $\bar{H}$ at P(1,1,1) and Q(0,-3,10) **[6]**

OR

Q4) a) Define conduction current and conduction current density **[4]**

b) Derive boundary condition at an interface between two magnetic media. **[6]**

P.T.O.

Q5) a) State and Prove Poynting theorem. Interpret each term **[8]**

b) A lossy dielectric has $\mu r = 1$ $\varepsilon r = 1$, $\sigma = 2 \times 10^{-8}$ mho/m an electric field $\bar{E} = 200 \sin \omega t \; a\bar{z}$ V/*m* exist at a certain point in the dielectric

i) At what frequency the conduction current and displacement current densities be equal.

ii) At this frequency calculate the instantaneous displacement current density. **[8]**

OR

Q6) a) Write Maxwell's equations for static and time varying fields in point and integral forms. **[8]**

b) Determine value of K such that the following pairs of fields satisfy Maxwell's equation in the region where $\sigma = 0, pr = 0$

i) $\bar{E} = [Kx - 100t]a\bar{y}$ *V/m*, $\bar{H} = [x + 20t]a\bar{z}$ *A/m* and $\mu = 0.25, \varepsilon = 0.01$

ii) $\bar{D} = [5xa\bar{x} - 2ya\bar{y} + Kz \; a\bar{z}$ $\mu C / m^2, \bar{B} = 2a\bar{y}mT$ and $\mu = \mu_0, \varepsilon = \varepsilon_0$ **[8]**

Q7) a) What is polarization Explain linear, Circular & Elliptical polarization **[8]**

b) A plane electromagenetic wave having frequency of 10MHz has an average Poynting vector of 1W/m^2. The medium is lossless with relative permeability 2 and relative permittivity 3, find

i) Velocity of propagation

ii) Wavelength

iii) Impedance of the medium

iv) r.m.s electric field E **[8]**

OR

Q8) a) Formulate wave equations from Maxwell's equation solve it for perfectly conducting media **[8]**

b) An $\bar{E}$ field in free space is given as

$\bar{E} = 800 \cos(10^8 t - \beta y) a\bar{z}$ *V/m*, find $\beta, \lambda, \bar{H}$ at P(0.1, 1.5, 0.4) **[8]**

Q9) a) Explain the following terms **[10]**

i) Skip distance

ii) Virtual height

iii) Critical frequency

iv) MUF

b) List out different modes of propagation. A 2 MHz circuit consist of transmitting antenna with 20 db gain and receiving antenna with 25db gain with respect to isotropic antennas. The input power to transmitting antenna is 200W. What is the maximum power received at a distance of 200km over a free space. **[8]**

OR

Q10) a) Derive fundamental equation for free space propagation and also obtain expression for electric field **[10]**

b) Calculate the skip distance for flat earth with MUF of 10 MHz. If wave is reflected from height of 300 km where maximum value of reflective index (η) is 0.9 **[8]**

////