Total No. of Questions : 8]

SEAT No. :

P3362

[Total No. of Pages : 3

[5353] - 553

TE. (Electronics and Telecommunication)

ELECTROMAGNETICS

(2015 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic packet calculator and smith chart is allowed.***
5) ***Assume suitable dada if necessary.***

Q1) a) Derive expression for $\bar{E}$ due to infinite line charge. **[8]**

b) Determine electric flux density at (4, 0, 3) if there is a point charge -5πmC at (4, 0, 0) and line charge 3π mC/m along the y-axis. **[8]**

c) Derive the relation between $\bar{E}$ and V. **[4]**

OR

Q2) a) Derive expression of $\bar{H}$ due to finite current carrying conductor. Also modify the expression for infinite conductor. **[8]**

b) Explain concept of Dielectric Polarization in detail. **[6]**

c) Derive expression for capacitance of spherical plate capacitor. **[6]**

Q3) a) State and prove Poynting theorem. Also explain significance of each term in it. **[8]**

b) Determine K so that each of the following pairs of field satisfies following Maxwell's equations : **[8]**

i) $\bar{D} = 6\hat{a}_x - 2y\hat{a}_y + 2z\hat{a}_z \, nC/m^2$

$\bar{H} = Kx\hat{a}_x - 10y\hat{a}_y - 25z\hat{a}_z \, A/m$

ii) $\bar{E} = (20y - Kt)\hat{a}_x \, V/m$

$\bar{H} = (y + 2\times10^6 t)\,\hat{a}_z \, A/m.$

P.T.O.

OR

Q4) a) State and explain Maxwell's equations for time varying field in detail. Also modify it for static fields. **[8]**

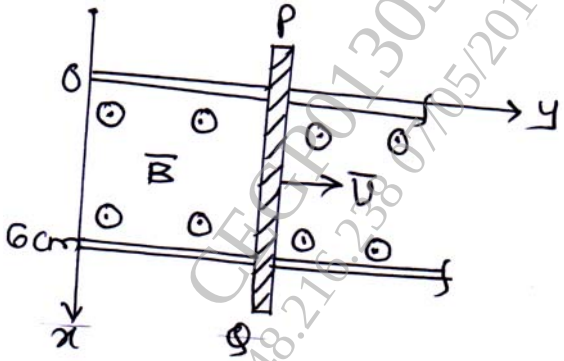
b) A conducting bar can slide freely over two conducting rails as shown in figure below. Calculate the induced voltage in the bar **[8]**

i) If the bar is stationed at y = 8cm and $\bar{B} = 4\cos 10^6 t\, \hat{a}_z\, mWb/m^2$

ii) If the bar slides at a velocity $\bar{V} = 20\hat{a}_y\, m/s$ *and* $\bar{B} = 4\hat{a}_z\, mWb/m^2$

iii) If the bar slides at a velocity $\bar{V} = 20\hat{a}_y\, m/s$ *and*

$\bar{B} = 4\cos(10^6 t - y)\hat{a}_z\, mWb/m^2$



Q5) a) State primary and secondary constants of transmission line. Also derive relationship Z_0 and γ in terms of primary constants. **[8]**

b) A transmission line has a characteristic impedance of 300 Ω and terminated in a load (150 + j150)Ω. Find following using Smith chart. **[8]**

i) VSWR,

ii) Reflection Coefficient,

iii) Input impedance at distance 0.1λ from the load,

iv) Input admittance from 0.1λ from the load.

CEGP013091 49.248.216.238 07/05/2018 14:01:41

OR

Q6) a) Derive general solution of transmission line. Also explain its physical significance. **[8]**

b) A generator of 1 v, 1 KHz supplies power to a 100 Km open wire transmission line terminated in Z_0. The line parameters are, **[8]**

$R = 10.4\ \Omega/Km$, $L = 0.00367$ H/Km, $G = 0.8 \times 10^{-6}$ mho/Km, $C = 0.00835 \times 10^{-6}$ F/Km.

Calculate Z_0, α, β, λ, velocity (V), received current, voltage and power.

Q7) a) Derive expression of electromagnetic wave equation in phasor form.Also derive expression of α and β from it. **[8]**

b) Determine the amplitude of the reflected and transmitted E and H at the interface of two media with the following properties. **[10]**

Medium 1 : $\xi_r = 8.5$, $\mu_r = 1$, $\sigma = 0$, Medium 2 : Free Space.

Assume normal incidence and the amplitude of E in medium 1 at the interface is 1.5 mV/m.

OR

Q8) a) Explain the concept of UPW. Also explain polarization of UPW along with its different types. (UPW = Uniform Plane Waves) **[10]**

b) Explain in detail the concept of depth of penetration. **[8]**

CEGP013091 49.248.216.238 07/05/2018 14:01:41