Total No. of Questions : 8]

SEAT No. :

P3362

[Total No. of Pages : 3

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

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

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OR

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

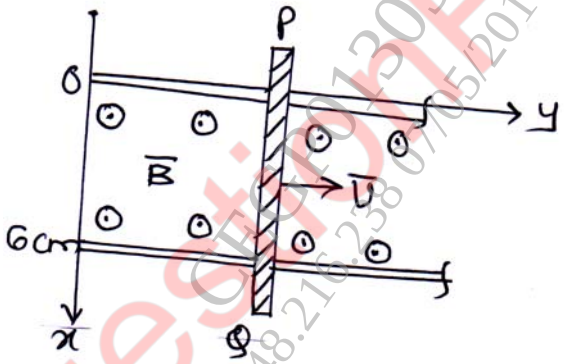
b) A conducting bar can slide freely over two conducting rails as shown in figure below. Calculate the induced voltage in the bar **[8]**

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.

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]**