Total No. of Questions : 8]

SEAT No. : ____

P758

[Total No. of Pages : 2

[5870] - 1062
T.E. (E & TC)
ELECTROMAGNETIC FIELD THEORY
(2019 Pattern) (Semester - I) (304182)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***

Q1) a) Derive the boundary condition between two perfect dielectric. **[10]**

b) Electric field intensity $\bar{E} = 60\bar{a}x + 20\bar{a}y - 30\bar{a}z$ V/m at a point on the interface between air and a conducting surface. Find $\bar{D}$ & ρ_s at that point. **[8]**

OR

Q2) a) The two concentric spherical shells having inner radius is 0.1m and its potential is 0 Volts. The outer radius is 0.2m and its potential is 100 Volts. The medium between them is a free space. Find $\bar{E}$ and $\bar{D}$ using spherical coordinate system. **[10]**

b) Derive Poisson's and Laplace equation. **[8]**

Q3) a) Derive an expression for magnetic vector potential in the region surrounding an infinitely long straight current carrying conductor along z-direction. **[9]**

b) Explain motional e.m.f. and transformer e.m.f. **[8]**

OR

Q4) a) In free space $\bar{E} = 20\cos(wt - 50x)\bar{a}_y \frac{V}{m}$, Calculate current density and magnetic field intensity. **[9]**

b) Write Maxwell's equation in differential and integral form for good conductor. **[8]**

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Q5) a) Derive electromagnetic wave equation E & H in phasor form. **[9]**

b) A uniform plane wave is travelling at a velocity of 3.5×10^5 *m/s* having wavelength 0.35mm in a non-magnetic good conductor. Find the frequency of wave and the conductivity of a medium. **[9]**

OR

Q6) a) What is polarization of uniform plane wave? Explain the different types of polarization. **[9]**

b) Find the reflected and transmitted electric and magnetic field intensity at the interface between $\varepsilon_r = 8.5, \mu_r = 1, \sigma = 0, E_i = 1.5V$ and in free space. **[9]**

Q7) a) Write the primary and secondary parameters of transmission line and derive the relationship between Z_0 in terms of primary constant. **[9]**

b) A line has zero dissipation has R = 0.006Ω/m, $L = \frac{2.5\mu H}{m}$, $C = 4.45\mu F / m$,. If the line is operated at 10MHz. Calculate characteristics impedance, propagation constant, Velocity of propagation, and wavelength. **[8]**

OR

Q8) a) The characteristic impedance of a high frequency line is 100Ω. It is terminated in an impedance of 100 + j100 Ω. Using smith chart find the impedance at 0.125 wavelength away from the load end. **[9]**

b) Derive the relationship between standing wave ratio and reflection coefficient. **[8]**

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