Total No. of Questions :8]

SEAT No. : ____

P1478

[Total No. of Pages :2

[5460] - 154

T.E. (E & Tc)

ELECTROMAGNETICS AND TRANSMISSION LINES

(2012 Course) (Semester - I) (End Semester) (304184)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Derive the expression of electric field intensity $\vec{E}$ due to charged circular ring. **[8]**

b) A linear homogeneous, isotropic dielectric material has ε_r=3.6 and covering the space between z = 0 and z = 1. If V = - 6000 z volts in the material, find **[6]**

i) $\vec{E}$

ii) $\vec{P}$

iii) ρ_s

c) State any two properties of curl and explain physical significance of curl. **[6]**

OR

Q2) a) Obtain $\vec{D}$ due to point charge Q placed at origin. Hence obtain relation between $\vec{D}$ and $\vec{E}$. **[8]**

b) Derive the boundary conditions between two perfect dielectrics. **[6]**

c) Derive $\vec{H}$ due to infinitely long straight conductor. **[6]**

P.T.O.

Q3) a) What is poynting vector? What is its significance? Derive the equation for average poynting vector. **[8]**

b) In a material for which σ = 5.0 S/m and ε_r=1 , the electric field intensity is E = 250 sin 10^{10}t V/m. Find the conduction and displacement current densities and frequency at which both have equal magnitude. **[8]**

OR

Q4) a) Write and explain Maxwell's equations for static and time varying field. **[8]**

b) What is uniform plane wave? Derive an expression for Helmholtz wave equation. **[8]**

Q5) a) Derive the relationship between primary and secondary constant. **[8]**

b) For an open wire overhead line β= 0.04 rad/km. Find the wavelength and velocity at frequency of 1600 Hz. Hence calculate the time taken by the wave to travel 90 km. **[8]**

OR

Q6) a) Derive the expression for characteristics impedance and propagation constant in terms of primary constant of transmission line. **[8]**

b) If attenuation constant is 18×10^{-3} N/m. Velocity of propagation is 1.8×10^{8} m/s and characteristics impedance is 60 Ω. Find out the primary line constant of such distortionless line at frequency of 100 MHz. **[8]**

Q7) a) Define standing wave ratio. Derive relation between standing wave ratio and magnitude of reflection coefficient. **[8]**

b) Derive the expression for input impedance for eight wave line and quarter wave line. **[10]**

OR

Q8) a) What do you mean by single stub matching? Derive the equation of single stub along the line. **[8]**

b) A transmission line of 100 m long is terminated in load of (100 – j 200) Ω. Determine the line impedance at 25 m from the load end at a frequency of 10 MHz. Assume line impedance Z_0 = 100 Ω. Determine the input impedance and admittance using smith chart. **[10]**

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