Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ECE/EIE) (Sem.–4)

ELECTROMAGNETIC FIELD THEORY

Subject Code : EC-208

Paper ID : [A0309]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a. Find the constant '*a*' so that vector $V = (x + 3y)a_x + (y - 2x)a_y + (x + az)a_z$ is solenoidal.

b. Find the curl of the vector field given by $A = yza_x + xza_y + xya_z$.

c. What is the significance of Stoke's theorem?

d. What is Polarization? What are the types of polarization?

e. List the boundary conditions on electric field in electromagnetism?

f. Is $\nabla \times H = J$ for time varying fields? Justify.

g. Write a short note on characteristic impedance.

h. What are the characteristics of TE waves?

i. Write down the condition for a line to be distortionless.

j. Define the term phase velocity.

SECTION-B

2. Find conduction & displacement current densities in a material having conductivity of 10^{-3} S/m & ε_r = 2.5 if the electric field in the material is E = 5.0 * 10^{-6}sin (9.0 * 10^9t) V/m.

3. Write Maxwell's equations in free space for time varying fields both in differential & integral form.

4. Discuss the reflection of plane wave at the interface of conductor for oblique incidence.

5. In a homogeneous non-conducting region where μ_r = 1, it is given that $E = 30 e^{j(\omega t - \frac{4}{3}z)} a_y$ V/m & $H = 1.0 e^{j(\omega t - \frac{4}{3}z)} a_x$ A/m. Calculate ε_r & ω.

6. A transmission line has a characteristic impedance of 100 ohms and is terminated in a load impedance of 200 + j180 ohms. Find the voltage reflection coefficient. How it is calculated on smith chart?

SECTION-C

7. A rectangular waveguide with dimensions of 3 cm × 2 cm operates at 10 GHz. Find

   (a) Cut-off frequency (f_c)

   (b) Cut-off wavelength (λ_c)

   (c) Guided wavelength (λ_g)

   (d) Phase constant (β_g)

8. What do you mean by transmission line? Derive an expression for transmission line equations.

9. (a) Define Poynting vector & derive an expression for poynting theorem.

   (b) Determine expression for average power of poynting vector.