D 90137 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2015

EC/PTEC 09 503—ELECTROMAGNETIC FIELD THEORY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Find the divergence of the vector $\overrightarrow{A} = x^2\overrightarrow{a_x} + y^2\overrightarrow{a_y} + z^2\overrightarrow{a_z}$.
2. If two charges of 50 μC and 10 μC are located at (– 1, 1, 3) and (3, 1, 0) respectively. Determine the magnitude and direction of force.
3. Mention the properties of uniform plane wave.
4. Find the skin depth at a frequency of 2 MHz in Aluminium where $\sigma = 38.2$ Ms/*m* and $\mu_r = 1$.
5. What is meant by standing wave ratio ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. If $V = \frac{60 \sin \theta}{r^2}$ volts, find the electric field intensity and potential at a point P (3,60°, 25°).
7. State and verify Stoke's theorem.
8. What do you mean by displacement current ? Write an expression for the total current density.
9. If a potential $v = x^2yz + Ay^3z$, find the value of A so that Laplace's equation is satisfied and electric field exists at a point (2, – 2, 1).
10. Write short notes on linear, circular and elliptical polarization of wave.
11. Discuss the application of Smith chart.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. (a) Apply Gauss law to find the charge enclosed in hollow sphere whose surface is uniformly charged. Derive the equation for potential due to a system of point charges.

Or

(b) Derive the magnetic boundary condition between two isotropic homogeneous linear materials with permeability μ_1 and μ_2.

13. (a) Obtain the Maxwell's equations in integral and point forms for time varying fields.

Or

(b) Derive the solution for wave equation propagating in free space.

14. (a) Derive the effect for reflection of plane waves when they incident on perfect dielectrics.

Or

(b) State and prove Poynting theorem. Write the expressions for instantaneous, average and complex Poynting vector.

15. (a) Derive the electric and magnetic field components for TE waves travelling in rectangular waveguide.

Or

(b) Obtain the expressions for voltage and current equations for waves propagating in lossless transmission line.

(4 × 10 = 40 marks)