D 20618 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B. TECH. (ENGINEERING) DEGREE EXAMINATION, OCTOBER 2011

EE 09 304/PTEE 09 303 – ELECTROMAGNETIC FIELD THEORY

(2009 Admissions)

Time : Three Hours Maximum : 70 marks

Part A

Answer **all** *questions.*

1. Give integral expression for the force on a closed circuit that carries a current I in a Magnetic field H.
2. Determine the potential difference between the points a and b which are at a distance of 0.4 m and 0.1 m respectively from a negative charge of 20×10^{-10} coulomb, $\varepsilon_0 = 8.854$ picoF/m.
3. Differentiate Self inductance and Mutual inductance.
4. What is a Poynting vector?
5. State Snells Law.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. State and prove Stokes theorem.
7. Derive continuity equation.
8. Prove that the electromagnetic power flow is the product of electric and magnetic field intensities.
9. State Poynting theorem.
10. Briefly explain phase velocity and group velocity.
11. With suitable sketch, explain Brewster angle.

(4 × 5 = 20 marks)

Part C

12. (a) (i) Derive an expression for the potential due to a spherical volume charge.

(ii) A spherical volume of radius 1 metre has a uniform charge density 1 C/m^3. Find the potential at a radius 50 cm.

(6 + 4 = 10 marks)

Or

(b) (i) Determine the electric field intensity of an infinitely long, straight, linecharge of a uniform density λ in air.

(ii) Discuss the electric field due to continuous charge distributions.

(6 + 4 = 10 marks)

13. (a) (i) Define a magnetic circuit with a sketch and hence obtain the expression for its reluctance.

(ii) Given a vector field $a = 15i + 0j + 0k$. Find the scalar and vector potentials.

(6 + 4 = 10 marks)

Or

(b) A magnetic circuit employs an air core toroid with 500 turns, cross sectional area 6 cm^2 mean radius 15 cm and coil current 4 A. Determine the reluctance of the circuit, flux density and magnetic field intensity.

(10 marks)

14. (a) From the fundamental law, derive the generalized Maxwell's equations in integral form.

Or

(b) Derive the wave equations for a conducting medium.

15. (a) (i) Discuss the properties and applications of Smith Chart.

(ii) A loss less transmission line with characteristic impedance of 75 ohm is terminated by a load impedance of 120 ohm. If the magnitude of incident wave is 10 volt, find the maximum and minimum values of voltage wave on the line and VSWR.

Or

(b) The open circuit and short-circuit impedances measured at the input terminals of a loss less transmission line of length 1.5 m, which is less than a quarter wavelength. are $-j54.6$ ohm and $j103$ ohm respectively.

(i) Find Z_0 of the line.

(ii) Without changing the operating frequency, find the input impedance of a short circuited line that is twice the given length.

(iii) How long should the short-circuited line be in order for it to appear as an open circuit at the input terminals?

(4 × 10 = 40 marks)