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Question Paper Code : 57286

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electronics and Communication Engineering

EC 6403 – ELECTROMAGNETIC FIELDS

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. State divergence theorem.
2. Define electric dipole.
3. Write the Laplace's equations in all the three coordinates.
4. What is dielectric polarization ?
5. Define magnetic vector and scalar potential.
6. A current of 3A flowing through an inductor of 100mH. What is the energy stored in inductor ?
7. Mention the force between too current elements.
8. Differentiate diamagnetic, paramagnetic and ferromagnetic material.
9. State Faraday's law of induction.
10. What is Poynting Vector ?

PART – B (5 × 16 = 80 Marks)

11. (a) Define the potential difference and electric field. Give the relation between potential and field intensity. Also Derive an expression for potential due to infinite uniformly charged line and also derive potential due to electric dipole. **(16)**

OR

(b) (i) State and prove Gauss law and explain any one of applications of Gauss law. **(8)**

(ii) Given two vectors $\vec{A} = 3\hat{a}_x + 4\hat{a}_y - 5\hat{a}_z$ and $\vec{B} = -6\hat{a}_x + 2\hat{a}_y + 45\hat{a}_z$, determine the unit vector normal to the plane containing the vectors $\vec{A}$ and $\vec{B}$. **(8)**

12. (a) (i) Derive the relationship between polarization and electric field intensity. **(8)**

(ii) Derive the capacitance of a spherical capacitor. **(8)**

OR

(b) (i) Derive the boundary conditions of the tangential and normal components of electric field at the interface of two mediums with dielectrics. **(10)**

(ii) If two parallel plates of area 4 m^2 are separated by a distance 6 mm, find the capacitance between these 2 plates. If a rubber sheet of 4 mm thick with $\varepsilon_r = 2.4$ is introduced in between the plates leaving a gap of 1 mm on both sides, determine the capacitance. **(6)**

13. (a) State Biot-Savart's law. Derive the expressions for magnetic field intensity and magnetic flux density at the centre of the square current loop of side *l*. Then determine the same for square loop of sides 5m carrying current of 10 A. **(16)**

OR

(b) Derive an expression for magnetic field due to an infinitely long coaxial cable. **(16)**

14. (a) (i) Derive the expression for force on a moving charge in a magnetic field and Lorentz force equation. **(8)**

(ii) Derive the inductance of a toroid. **(8)**

OR

(b) (i) Derive an expression for inductance of a solenoid. Calculate the inductance of solenoid, 8 cm in length, 2 cm in radius, having $\mu_r = 100$ and 1000 turns. **(8)**

(ii) Give the comparison between magnetic and electric circuits. **(8)**

15. (a) Derive the Maxwell's equation in differential and integral forms. **(16)**

OR

(b) Starting from Maxwell's equation, derive homogeneous vector Helmholtz's equation in phasorform. **(16)**