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Question Paper Code :

B.E/B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 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 coulombs law.
2. What is an electric potential? Write expression for potential due to an electric dipole.
3. Define resistance of a conductor.
4. Give Laplace's and Poisson's equations.
5. State Ampere's circuital law.
6. What is vector magnetic potential?
7. Calculate the mutual inductance of two inductively tightly coupled coils with self-inductance of 25 mH and 100 mH.
8. Give the expression for Lorentz force equation.
9. Define Phase velocity.
10. Find the displacement current density for field $E = 300 \sin 10^2 t$ V/m.

PART-B - (5×16=80 Marks)

11. a) (i) State and prove Stokes theorem. **(8)**
    (ii) Derive the expression for energy and energy density in static electric fields. **(8)**

    (OR)

    b) (i) A circular disc of radius 'a' meter is charged uniformly with a charge of ρ c/m. find the electric field intensity at a point h meter from the disc along its axis. **(10)**
    (ii) Explain the concept of superposition principle of electric field intensity. **(6)**

12. a) Derive an expression for capacitance of a coaxial cable. **(16)**

    (OR)

    b) i) Derive an expression for Polarization 'P'. **(4)**
    ii) State and explain the electric boundary conditions between two dielectrics materials. **(12)**

13. a) From Biot Savart's law obtain expression for magnetic field intensity and vector potential at a point P and distance 'R' from infinitely long straight current carrying conductor. **(16)**

    (OR)

    b) (i) Consider two identical circular current loops of radius 3 m and opposite current 20 Amps are in parallel planes, separated on their **(8)**

common axis by 10 m. find the magnetic field intensity at a point midway between the two loops.

(ii) State Biot-Savart's law. Find the magnetic field intensity at the origin due to current element I $Id\vec{l} = 3\pi(\vec{a}_x + 2\vec{a}_y + 3\vec{a}_z)\mu\ A.m$ at (3, 4, 5) in free space. **(8)**

14. a) (i) A charged particle with velocity $\vec{u}$ is moving in a medium containing uniform field $\vec{E} = E\vec{a}_x$V/m and $\vec{B} = B\vec{a}_y$Wb/m^2. What should $\vec{u}$ be so that the particle experiences no net force on it? **(8)**

(ii) State and derive the magnetic boundary conditions between the two magnetic mediums. **(8)**

(OR)

b) Derive the expression for inductance and magnetic flux density inside the solenoid. Calculate the inductance of the solenoid and energy stored when a current of 8 A flowing through the solenoid of 2m long, 10 cm diameter and 4000 turns. **(16)**

15. a) (i) State and prove Poynting's theorem and give its physical interpretation. **(8)**

(ii) Derive Maxwell's equations for time varying fields. **(8)**

(OR)

b) Derive the wave equation starting from Maxwell's equation for free space. **(16)**