

Question Paper Code: 40992

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Third Semester

Electrical and Electronics Engineering EE 6302 – ELECTROMAGNETIC THEORY (Regulations 2013)

Time: Three Hours

Maximum: 100 Marks



Answer ALL questions

PART - A

(10×2=20 Marks)

- 1. Find the unit vector extending from the origin toward the point P(3, -1, -2).
- 2. Determine the electric field intensity in free space if $\vec{D} = 30\vec{a}_x$ C/m².
- 3. Mention the properties of electric flux lines.
- 4. State the electrostatic boundary conditions at the interface between two dielectrics.
- 5. What is the total force acting on a moving charge, Q in the presence of both electric and magnetic fields.
- 6. Compare magnetic scalar potential and magnetic vector potential.
- Define Reluctance and Permeability.
- 8. Distinguish between conduction and displacement currents.
- 9. Mention the practical importance of 'Skin depth'.
- 10. What is 'Standing Wave Ratio'?



(7)

PART - B

(5×13=65 Marks)

- 11. a) i) With neat diagrams, explain the spherical system with co-ordinates (R, θ , ϕ). (6)
 - ii) Apply Coulomb's law to find the electric field intensity at any point P due to a straight, uniformly charged wire of linear charge density + λ C/m.
 The point P is at a distance of 'h' m above the wire.

(OR)

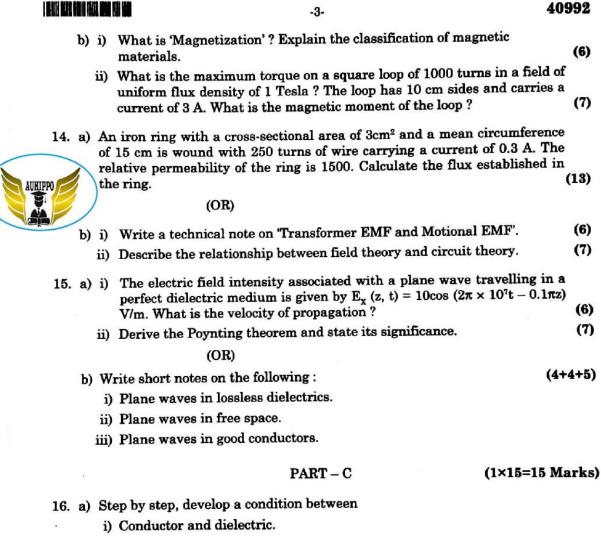
- b) i) Explain the divergence of a vector field and divergence theorem. (6)
 - ii) By mean of Gauss's law, determine the electric field intensity inside and outside a spherical shell of radius R. The shell contains a total charge Q uniformly distributed over the surface.
- 12. a) i) Two point charges $-4 \mu C$ and $5 \mu C$ are located at (2, -1, 3) and (0, 4, -2) respectively. Find the potential at (1, 0, 1) assuming zero potential at infinity. (6)
 - ii) A parallel plate capacitor has a plate separation t. The capacitance with air only between the plates is C. When a slab of thickness \mathbf{t}' and relative permittivity $\mathbf{\epsilon}'$ is placed on one of the plates, the capacitance is \mathbf{C}' Show

hat $\frac{C'}{C} = \frac{\varepsilon' t}{(t' + \varepsilon' (t - t'))}$.

(OR)

- b) i) Explain briefly the polarization in dielectrics.
 - ii) Derive Laplace's and Poisson's equations from Gauss's law for a linear material medium. State the importance of these equations. (7)
- a) i) By means of Biot-Savart's law, derive an expression for the magnetic field intensity at any point on the line through the centre at a distance 'h' from the centre and perpendicular to the plane of a circular loop of radius 'ρ' and carrying current 'I.'
 - ii) An iron ring, 0.2 m in diameter and 10 cm² sectional area of the core, is uniformly wound with 250 turns of wire. The wire carries a current of 4 A. The relative permeability of iron is 500. Determine the value of self-inductance and the stored energy.

(OR)



ii) Dielectric and dielectric.

(15)

b) From the basics, derive the expressions for Maxwell's equation in differential (15)and integral form.

