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Question Paper Code : 91447

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth Semester

Electronics and Communication Engineering

EC6403 – ELECTROMAGNETIC FIELDS

(Regulations 2013)

(Common to PTEC6403 – Electromagnetic Fields for B.E. (Part -Time) – Third

Semester – Electronics and Communication Engineering

(Regulations 2014)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. State Stokes theorem.
2. Define potential difference.
3. What is polarization ?
4. What is 'method of images' ? When it is used ?
5. State Biot Savart Law.
6. State Ampere's circuital law.
7. Define torque and its expression.
8. What is a Ferromagnetic material ? Give example.
9. Define Poynting vector, what is its SI unit ?
10. State Faraday's law of electromagnetic induction.

PART – B

(5×13=65 Marks)

11. a) Derive the electric field due to infinite line charge with charge density ρ_L .

(OR)

- b) i) What is energy density ? Explain energy density in electrostatic fields and derive the expression for energy storage. **(8)**
- ii) Define Coulombs law. What is its proportionality constant K in free space ? **(5)**



12. a) Explain boundary conditions for electric fields between conductor and free space.

(OR)

- b) Derive capacitance of a coaxial cable and for a spherical capacitor.

13. a) Derive magnetic field intensity for a Co-axial Cable.

(OR)

- b) i) Determine magnetic field intensity due to infinitely long conductor using Ampere's Law. (7)

- ii) Given the vector magnetic potential, $\vec{A} = \frac{10}{x^2 + y^2 + z^2} \mathbf{a}_x$, obtain the magnetic flux density. (6)

14. a) i) Derive the inductance of a coaxial cable. (7)

- ii) Derive the inductance of a solenoid. (6)

(OR)

- b) Explain and derive the magnetic field boundary condition for two different dielectrics.

15. a) Derive displacement current from circuital analysis and from Ampere circuital law.

(OR)

- b) Derive and explain Maxwell's equations both in integral and point forms.

PART - C

(1×15=15 Marks)

16. a) A point charge $Q = 18 \text{ nc}$ has a velocity of $5 \times 10^6 \text{ m/s}$ in the direction

$$\vec{a}_v = 0.6 \mathbf{a}_x + 0.75 \mathbf{a}_y + 0.3 \mathbf{a}_z$$

Calculate the magnitude of the force exerted on the charge by

$$\vec{E} = -3\mathbf{a}_x + 4\mathbf{a}_y + 6 \mathbf{a}_z \text{ kv/m}$$

$$\vec{B} = -3\mathbf{a}_x + 4\mathbf{a}_y + 6 \mathbf{a}_z \text{ MT}$$

(OR)

- b) Given a $60 \mu\text{C}$ point charge located at the origin. Find the electric flux passing through the closed surface defined by $\rho = 26 \text{ cm}$ and $z = \pm 26 \text{ cm}$.