

B.E. DEGREE EXAMINATIONS: NOV/DEC 2010

Third Semester

ELCTRICAL AND ELECTRONICS ENGINEERING

EEE102: Electromagnetic Theory

Time: Three Hours**Maximum Marks: 100****Answer ALL Questions:-****PART A (10 x 1 = 10 Marks)**

- The stokes theorem is applied to
 - Closed surface
 - open surface
 - volume
 - open line
- Which of the following is a scalar field?
 - Velocity
 - Wind velocity
 - Temperature
 - Atmospheric Pressure at the valve opening
- Electric flux is denoted by
 - ϕ
 - χ
 - ψ
 - β
- The electric field intensity of an infinite sheet of charge is
 - $\frac{\rho_s}{2\epsilon_0}\bar{a}_z$
 - $\frac{\rho_s}{2}\bar{a}_z$
 - $\frac{\rho_s}{\epsilon_0}\bar{a}_z$
 - $\frac{2\rho_s\epsilon_0}{\bar{a}_z}$
- Gauss's law for magnetic field is given by
 - $\int_S \bar{B} \cdot d\bar{S} = 0.$
 - $\int_L \bar{B} \cdot d\bar{L} = 0.$
 - $\int_S \bar{E} \cdot d\bar{S} = 0.$
 - $\int_L \bar{E} \cdot d\bar{L} = 0.$
- which of the following is true for a scalar magnetic potential.
 - $\bar{H} = \nabla V_m$
 - $\bar{H} = -\nabla V_m$
 - $\bar{H} = -\nabla_x V_m$
 - $\bar{H} = -\nabla V_m$
- The ratio of the magnitudes of conduction current density (J_C) and displacement current density (J_D) is.
 - $\frac{\sigma}{\omega}$
 - $\frac{\sigma}{\omega\epsilon}$
 - $\frac{\sigma\omega}{\epsilon}$
 - $\frac{\sigma\epsilon}{\omega}$
- All of the following can induce emf in a coil of wire except
 - Moving a magnet through the coil
 - Placing a stationary coil of wire in an increasing magnetic field.
 - Placing a stationary coil of wire in a stationary magnetic field.
 - Placing a stationary coil of wire in a decreasing magnetic field
- Propagation constant for a perfect dielectric is given by
 - $\pm \sqrt{\mu\epsilon}$
 - $\pm j\omega\sqrt{\mu}$
 - $\pm j\omega\sqrt{\mu\epsilon}$
 - $\pm j\sqrt{\mu\epsilon}$

10. For a good conductor, amplitude of the wave traveling through it reduces to almost zero within _____ distance.
- a) 1δ b) 2δ to 3δ c) $\frac{1}{2}\delta$ to δ d) 4δ .

PART B (10 x 2 = 20 Marks)

11. State divergence theorem?
 12. What are the main sources of electromagnetic field?
 13. State coulomb's law.
 14. Write down the expressions for Laplace's and Poisson's equations.
 15. State the expression for polarization.
 16. Give the expression for H due to infinite line charge.
 17. State ampere's circuital law.
 18. State Poynting theorem.
 19. State Faraday's law.
 20. What is skin effect?

PART C (5 x 14 = 70 Marks)

21. a) Given $\vec{A} = 2r \cos \phi \vec{a}_r + r \vec{a}_\phi$ in cylindrical co-ordinates. For the contour $x=0$ to 1, $y=0$ to 1. Verify stoke's theorem.
 (OR)
 b) Evaluate both sides of divergence theorem for the field $\vec{D} = 2xy \vec{a}_x + x^2 \vec{a}_z$ and the rectangular parallel piped formed by the planes $x = 0$ and 1, $y = 0$ and 2, $z = 0$ and 3.
22. a) Derive an expression for electric field intensity E due to an uniformly charged infinitely long straight line with constant charge density in C/m.
 (OR)
 b) If $V=2x^2y+20z-[4/(x^2+y^2)]$, find the vectors E, D and ρ_v at P(6, -2.5, 3).
23. a) Find the magnetic field strength due to an infinite current carrying conductor. Also find the magnetic flux density.
 (OR)
 b) Find the torque produced in a planar coil of 'n' turns which carries a current of I amperes.
24. a) Derive the expressions for transformer and motional emf.
 (OR)
 b) From fundamental laws, derive the generalized Maxwell's equations.
25. a) Derive the wave equation in free space.
 (OR)
 b) Explain the reflection and refraction of waves for a dielectric boundary with neat sketches.
