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Question Paper Code: 31443

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Fourth Semester

Electronics and Communication Engineering

01UEC403 – ELECTROMAGNETIC FIELDS

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. State Divergence theorem.
2. State Stoke's theorem.
3. What is the difference between scalar and vector magnetic potential?
4. Define magnetic vector potential.
5. Obtain Poisson's equation from Gauss's law.
6. What is the relation between relative permeability and susceptibility.
7. In a material for which $\sigma = 5\text{ s/m}$ and $\epsilon_r = 1$ and $E = 250 \sin 10^{10} t$ (V/m). Find the conduction and displacement current densities.
8. Write Maxwell's equation in point and integral form for good conductors.
9. What is skin effect?
10. Mention the properties of uniform plane wave.

PART - B (5 x 16 = 80 Marks)

11. (a) Derive an expression for the electric field due to a straight and infinite uniformly charged wire of length 'L' meters and with a charge density of $+\lambda$ c/m at a Point P which lies along the perpendicular bisector of wire. (16)

Or

- (b) (i) State and prove divergence theorem. (8)
- (ii) A uniform line charge $\rho_L = 25 \text{ N C/m}$ lies on the $x=3\text{m}$ and $y=4\text{m}$ in free space. Find the electric field intensity at a point $(2, 3 \text{ and } 15) \text{ m}$. (8)
12. (a) (i) Derive the expression for torque developed in a rectangular closed circuit carrying current I in a uniform field. (8)
- (ii) State Ampere's circuital law and explain any two applications of Ampere's Circuital law. (8)

Or

- (b) Derive the expressions for magnetic field intensity and magnetic flux density due to circular coil. (16)
13. (a) Derive the boundary conditions of the normal and tangential components of magnetic field at the inter face of two media with different dielectrics. (16)

Or

- (b) (i) Derive an expression for the capacitance of a parallel plate capacitor having two dielectric media. (10)
- (ii) Derive an expression for capacitance of co-axial cable. (6)
14. (a) State Ampere's circuital law and prove the modified form of Ampere's circuital law as Maxwell's first equation in integral form. (16)

Or

- (b) (i) Derive the expression of Maxwell's equation in differential and integral forms and explain it. (10)
- (ii) Write short notes on Faraday's law of electromagnetic induction. (6)
15. (a) (i) From the Maxwell's equation, derive the electromagnetic wave equation in conducting medium for E and H fields. (8)
- (ii) Derive the expression for free space electromagnetic wave equation.. (8)

Or

- (b) Explain about the wave incident normally on perfect conductor and obliquely to the surface of perfect conductor. (16)