Reg. No. : | | | | | | | | | | |

Question Paper Code: 31443

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Fourth Semester

Electrical and Electronics Engineering

01UEC403 – ELECTROMAGNETIC FIELDS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. State Stoke's theorem.
2. Define unit vector. Give its significance.
3. State Biot-Savart law.
4. State Ampere's circuital law.
5. List the expressions for inductance of solenoid and toroid.
6. Define capacitance and state the factors on which it depends.
7. Moist soil is having the conductivity of 10^{-3} *s/m* and $\varepsilon_r = 2.5$. If $E = 4 \sin 8t$, then find the conduction current density.
8. Give the expression of power flow in co-axial cable.
9. Define skin effect.
10. Define Brewster angle.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Develop an expression for an electric field due to an infinite sheet of charge having uniform charge density ρ_s *C/m*^{2},placed in *xy* plane cut a point *P* on *z*-axis at a distance of '*z*' *m* from the origin. (10)

    (ii) Show the expressions to find the '*E*' for charged infinite line, charged finite line and charged circular disc. (6)

Or

(b) Evaluate the divergence theorem considering the field $D = 2xy\bar{a}_x + x^2\bar{a}_y c/m^2$ and a rectangular parallelepiped formed by the planes x=0, x=1; y=2 and z=0, z=3. (16)

12. (a) Derive the expression for magnetic flux intensity on the axis of a rectangular and circular loop carrying a current. (16)

Or

(b) (i) Apply Biot-Savart law to develop the expression for magnetic field intensity at a point due to a finite long straight filament carrying a steady current. (10)

(ii) Explain about the Lorentz force equation for a moving charge. (6)

13. (a) (i) Explain in detail about continuity equation for current. (8)

(ii) Calculate the inductance of the Solenoid with 300 turns, *L*=0.65 *m* and circular cross section of radius 0.03 *m* and 2000 turns with wound over a length of 500 *mm* on a cylindrical paper tube 40 *mm* diameter. (8)

Or

(b) Derive the capacitance of the spherical capacitor and parallel plate capacitor using Laplace equation. (16)

14. (a) Derive Maxwell's equation from Amperes circuital law and Faradays law. (16)

Or

(b) (i) Derive the Poynting vector from Maxwell's equation and explain. (10)

(ii) A lossy dielectric has μ_r=1, ε_r=1 and σ=2 x 10^{-8} *s/m*. An electric field $E = 200\sin\omega t a_z \frac{V}{m}$ exists at a certain point in the dielectric. At what frequency the conduction and displacement current densities are equal? (6)

15. (a) (i) Derive wave equations in phasor form. (10)

(ii) Given that the electric field intensity of an electromagnetic wave in a non-conducting dielectric medium with permittivity $\varepsilon=9\varepsilon_0$ and permeability μ_0. $E(z,t) = a_y 5\cos(10^9 t - \beta z)\frac{V}{m}$. Find the magnetic field intensity '*H*' and value of 'β'. (6)

Or

(b) Discuss about uniform plane wave and also derive Maxwell's equation in phasor form. (16)