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

Question Paper Code: 31333

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

Third Semester

Electrical and Electronics Engineering

01UEE303 - FIELD THEORY

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. State divergence theorem.
2. Write the condition for a vector $\bar{A}$ to be (a) solenoidal and (b) irrotational.
3. State Coulomb's law.
4. A parallel plate capacitor has a charge of 10^{-3} *C* on each plate, while the potential difference between the plates is 1000 Volts. Calculate the value of capacitance.
5. Write the expression for magnetic field '*H*' at the centre of a circular coil carrying a current of '*I*' amperes. The radius of the coil is 'α' *m*.
6. Define the following terms: (a) Magnetic moment (b) Biot - Savart's law.
7. A conductor of 1 *m* length is moved with a velocity of 100*m/sec*, perpendicular to a field of 1 Tesla. What is the value of emf induced?
8. What is the significance of displacement current?
9. Calculate the characteristic impedance of free space.
10. Define loss tangent.

PART - B (5 x 16 = 80 Marks)

11. (a) Derive electric field intensity at the given point due to the line charge of infinite length. (16)

Or

(b) (i) A circular ring of radius '*a*' carries a uniform charge *L C/m* and is placed on the *XY* plane with the axis same as *Z* axis. Find the electrical field intensity. (8)

(ii) Determine the flux of *G(r)* out of entire surface of the cylinder *r*=1, when $G(r) = 10e^{-2z}(r\alpha_r + \alpha_z)$. (8)

12. (a) Write the expression for Laplace and Poisson's equation and derive it for various coordinate systems. (16)

Or

(b) (i) A linear, homogeneous, isotropic dielectric material has ε_r=3.6 and is covering the space between z = 0 and z = 1. If V = - 6000z volts in the material, find the following: $\bar{E}, \bar{P}$ *and* ρ_S. (6)

(ii) Derive the boundary conditions at the interface of two dielectrics. (10)

13. (a) (i) Calculate field using Ampere's circuital law for infinitely long solenoid. (8)

(ii) A current filament of 5.0 *A* in the a_y direction is parallel to the *y* axis at x = 2 *m* and z= -2 *m*. Find *H* at the origin. (8)

Or

(b) (i) Derive Biot-Savart's law and Ampere's law using the concept of magnetic vector potential. (8)

(ii) The core of a toroid is of 12 cm^2 area and is made of material with μ_r=200. If the mean radius of the toroid is 50 *cm*, calculate the number of turns needed to obtain an inductance of 2.5 H. (8)

14. (a) (i) Compare circuit theory and field theory. (8)

(ii) Explain briefly the transformer and motional emf. (8)

Or

(b) Derive the time-harmonics of Maxwell's equations in integral form and point form. (16)

15. (a) Briefly explain about the wave incident

(i) Normally on perfect conductor. (8)

(ii) Obliquely to the surface of perfect conductor. (8)

Or

(b) (i) Derive the Poynting theorem and give its significances. (12)

(ii) Describe briefly about reflection coefficient and Transmission coefficient. (4)