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

Question Paper Code: 31333

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

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 Stokes' theorem.
2. Mention the sources of electromagnetic fields.
3. Define 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. State Ampere's Circuital law.
6. Define magnetization.
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. What is intrinsic impedance of free space? What is its value?

PART - B (5 x 16 = 80 Marks)

11. (a) (i) State and prove Divergence theorem. (6)

(ii) Explain Cylindrical coordinate system and differential elements in Cylindrical coordinate system. (10)

Or

(b) (i) Convert the point P (3,4,5) from Cartesian to Spherical coordinates. (6)

(ii) Use Spherical coordinates and integrate to find the area of the region $0 \leq \Phi \leq \alpha$ on the Spherical shell of radius 'a'. What is the area if $\alpha = 2\pi$? (6)

(iii) State the Gradient in three coordinate systems. (4)

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) Derive the boundary conditions to explain the behaviour of magnetic field at the interface of two magnetic media. (8)

(ii) Derive an expression for B and H due to finite long straight conductor. (8)

Or

(b) (i) Derive an expression for the Inductance of Solenoid and Toroid. (8)

(ii) Explain the concept of scalar and vector magnetic potentials. (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) (i) State the Poynting vector and establish its usage in Electromagnetic wave analysis. (8)

(ii) Derive the Electromagnetic wave equations. (8)

Or

(b) (i) A uniform plane wave in a medium having $\sigma = 10^{-3}$s/m, $\varepsilon = 80\varepsilon_0$ and $\mu = \mu_0$ is having a frequency of 10kHZ. Calculate the different parameters of the wave. (8)

(ii) Derive the expression for wave propagation in lossless medium. (8)

31333