Reg. No. :

Question Paper Code: 31033

B.E. / B.Tech. DEGREE EXAMINATION, OCTOBER 2014.

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. What are the sources of Electromagnetic fields?

3. Define Coulomb's law.

4. Write down Laplace's and Poisson's equations.

5. State Ampere's Circuital law.

6. Define Torque.

7. Distinguish between transformer e.m.f and motional e.m.f.

8. What is the significance of displacement current?

9. Define skin depth.

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) (i) Derive the expression for electric field intensity due to charged circular ring. (8)

   (ii) A parallel plate Capacitor is chosen with d = 1m, plate area $0.8m^2$ and a dielectric relative permittivity of 2.8. A dc volt of 500V is applied between the plates. Find the capacitance and energy stored. (8)

Or

   (b) (i) Explain the Gauss's law applied to the case of infinite line charge and derive the expression for 'D' due to the infinite line charge. (8)

   (ii) Derive the expression for energy density in electrostatic fields. (8)

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) Write short notes on Faraday's laws of electromagnetic induction. (6)

   (ii) What are the different ways of emf generation? Explain with the governing equations and suitable practical examples. (10)

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(b) (i) On the basis of the analysis of the transmission line, compare field theory and circuit theory. (4)

(ii) With necessary explanation, derive the Maxwell's equation in differential and integral form. (12)

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)

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