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**Question Paper Code: 33303**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Third Semester

Electrical and Electronics Engineering

01UEE303 - FIELD THEORY

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

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 meant by Poynting vector?

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) State and prove Gauss's law. (8)  
(ii) State Laplace and Poisson's equations and explain their significance in the field theory. (8)

Or

- (b) Obtain the boundary conditions between a conductor and free space of electric field. (16)

13. (a) Using Bio-Savart law find H due to finite and infinitely long straight conductor. (16)

Or

- (b) (i) Derive the boundary conditions of magnetic field at dielectric and conductor. (8)  
(ii) What is magnetization? Explain the classification of magnetic materials with examples. (8)

14. (a) (i) Derive the expressions for displacement current and conduction current densities. (8)  
(ii) State and derive the Maxwell's equation for free space in integral and point forms for time varying fields. (8)

Or

- (b) What are the different ways of emf generation? Explain with the governing equations and suitable practical examples. (16)

15. (a) State the Poynting vector and establish its usage in Electromagnetic wave analysis. (16)

Or

(b) (i) A uniform plane wave in a medium having  $\sigma = 10^{-3}$  s/m,  $\epsilon = 80\epsilon_0$  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)

