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Question Paper Code: 53303

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2022

Third Semester

Electrical and Electronics Engineering

15UEE303 - FIELD THEORY

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- The maximum space rate of change of that function is CO1- R
(a) Gradient (b) Divergence (c) Curl (d) Del operator
- Under what condition the vectors are said to be in parallel CO1- R
(a) $A \cdot B = 0$ (b) $A \times B = 0$ (c) $\Delta \cdot A = 0$ (d) $\Delta \times A = 0$
- Relation between electric field intensity and electric flux density CO2- R
(a) ϵ / σ (b) $\epsilon \sigma$ (c) $E \epsilon$ (d) σ / ϵ
- All the charges on a conducting body remains on _____ of the body CO2- R
(a) Inside (b) Outside (c) Surface (d) All the above
- Polarization is defined as CO3- R
(a) Dipole moment / volume (b) Dipole moment / Area
(c) Volume/ dipole moment (d) Dipole moment / length
- Relation between B&H is CO3- R
(a) $B = \mu H$ (b) $H = \mu B$ (c) $B = \mu / H$ (d) None of the above
- The concept of displacement current was a major contribution CO4- R
attributed to
(a) Faraday (b) Lenz (c) Maxwell (d) Lorentz

8. Circuit theory is CO4- R
- (a) Three dimensional analysis (b) Reference frequency
- (c) Simple to understand (d) Voltage is not directly involved
9. For a uniform plane wave E and H is at CO5- R
- (a) Parallel to each other (b) Perpendicular to each other
- (c) Different frequency (d) Different phase
10. The characteristic impedance of free space is given by _____ Ohms CO5- R
- (a) 377 (b) 375 (c) 376 (d) 378

PART – B (5 x 2= 10 Marks)

11. Give the physical significance of Divergence. CO1 R
12. Recall the formula for finding force between two charges in vector form. CO2 R
13. State Gauss law for magnetic field. CO3 R
14. Compare Transformer and Motional EMF CO4 A
15. Write the velocity of wave propagation in lossless medium CO5 R

PART – C (5 x 16= 80Marks)

16. (a) Explain in detail the basics of different co-ordinate system and derive its relevant equations CO1- App (16)
- Or
- (b) Verify the divergence theorem for the following vector CO1- App (16)
 $A = xy^2 \mathbf{a}_x + y^3 \mathbf{a}_y + y^2 z \mathbf{a}_z$ and the surface is a cuboid defined by
 $0 < x < 1, 0 < y < 1, 0 < z < 1.$
17. (a) State and explain the boundary conditions for electric field CO2- App (16)
- Or
- (b) (i) Derive poisson's and Laplace equation? CO2- App (8)
- (ii) Find the electric field intensity at a distance x above an infinite straight wire. CO2- App (8)

18. (a) (i) State and Explain Biot savarts law. CO3- App (6)
- (ii) Obtain the flux density and field intensity for circular coil. CO3- App (10)
- Or
- (b) (i) Establish the relation of force between current carrying parallel conductors CO3 - App (8)
- (ii) Determine the force between two long parallel wires of 200m length separated by 5cm in air and carrying currents of 40A same direction and in opposite direction CO3 - App (8)
19. (a) State and derive the Maxwell's equation in Integral form and point form for conducting medium CO4- U (16)
- Or
- (b) (i) Develop the equation for conduction current density. CO4- U (8)
- (ii) Compare Field Theory and Circuit Theory CO4- U (8)
20. (a) Deduce the Wave equation for time varying fields in free space CO5- App (16)
- Or
- (b) State poynting theorem. Derive the expression for it CO5- App (16)

