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**Question Paper Code: 53303**

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

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)

1. The maximum space rate of change of that function is CO1 -R  
(a) Gradient (b) Curl (c) Divergence (d) del operator
2. 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)  $\Delta \times A = 0$
3. Poisson's equation is CO2-R  
(a)  $\Delta^2 V = -\rho/\epsilon$  (b)  $\Delta^2 V = 0$  (c)  $\Delta V = -\rho/\epsilon$  (d)  $\Delta V = 0$
4. Relation between electric field intensity and electric flux density  $D =$  CO2- R  
(a)  $\epsilon/\sigma$  (b)  $\epsilon/E$  (c)  $E \epsilon$  (d)  $\sigma/\epsilon$
5. Hysteresis loop gives the relation of CO3- R  
(a) B lags H (b) B leads H (c) B independent (d) none of the above
6. Inductance of a toroid is directly proportional to CO3- R  
(a) No. of turns (b) square of the area (c) area (d) volume
7. Maxwells equation IV is derived from CO4- R  
(a) Faradays law (b) Amperes circuit law  
(c) Gauss law of electric field (d) Gauss law of magnetic field
8. Circuit theory satisfies CO4- R  
(a) Three dimensional analysis (b) simple to understand  
(c) reference frequency (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) different frequency  
(c) Perpendicular to each other (d) different phase
10. The characteristic impedance of free space is given by CO5- R
- (a) Ratio of E and H (b) permeability / permittivity  
(c) square root of Ratio of E and H (d) permittivity / permeability

PART – B (5 x 2= 10Marks)

11. Give the physical significance of Divergence. CO1- R
12. State Coulomb’s law of electric charges. CO2- R
13. Brief amperes circuital law CO3- R
14. Compare Field Theory and Circuit Theory CO4- R
15. What do you mean by “Depth of penetration”? CO5- R

PART – C (5 x 16= 80Marks)

16. (a) Verify the divergence theorem for the following vector  $A=xy^2ax+y^3ay+y^2zaz$  and the surface is a cuboid defined by  $0<x<1, 0<y<1, 0<z<1$ . CO1 -App (16)
- Or
- (b) Explain in detail the basics and differential elements of different co-ordinate system and derive its relevant equations CO1- App (16)
17. (a) (i) Obtain the dipole moment of electric dipole. CO2- App (8)  
(ii) Derive an expression for energy density in electrostatic fields. CO2- App (8)
- Or
- (b) Show that the tangential component of Electric field intensity is continuous across the boundary, whereas the normal component of Electric field intensity is discontinuous at the boundary. CO2- Ana (16)
18. (a) Determine the magnetic field at point P due to the current carrying conductor. CO3- Ana (16)
- Or
- (b) (i) State and Explain Biot savarts law CO3- Ana (8)  
(ii) Explain clearly about magnetic scalar and vector potential CO3- Ana (8)

19. (a) With necessary explanation, derive the Maxwell's equation in differential and integral forms. CO4 -U (16)
- Or
- (b) State and explain Faraday's law of electromagnetic induction and derive the expressions for statically and dynamically induced emf. CO4 -Ana (16)
20. (a) (i) State and explain Poynting's theorem CO5- U (12)
- (ii) What is the physical significance of the Poynting theorem CO5- R (4)
- Or
- (b) Determine the wave velocity and characteristic impedance for its propagation in free space. CO5 U (16)

