A

Reg. No. :

Question Paper Code: 53303

B.E. / B.Tech. DEGREE EXAMINATION, MAY 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)

1. The maximum space rate of charge of that function is   CO1- R

    (a) Gradient   (b) Divergence   (c) Curl   (d) Del operator

2. Under what condition the vectors are said to be in parallel   CO1- R

    (a) A.B=0   (b) AxB=0   (c) Δ.A=0   (d) ΔxA=0

3. Relation between electric field intensity and electric flux density   CO2- R

    (a) ε/σ (b) $\varepsilon\sigma$ (c) $E \varepsilon$ (d) σ /ε

4. All the charges on a conducting body remains on_____ of the body   CO2- R

    (a) Inside   (b) Outside   (c) Surface   (d) All the above

5. Polarization is defined as   CO3- R

    (a) Dipole moment / volume   (b) Dipole moment / Area

    (c) Volume/ dipole moment   (d) Dipole moment / length

6. Relation between B&H is   CO3- R

    (a) B=μH   (b) H=μB   (c) B=μ/H   (d) None of the above

7. 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

<div align="center">PART – B (5 x 2= 10 Marks)</div>

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 propogation in lossless medium   CO5 R

<div align="center">PART – C (5 x 16= 80Marks)</div>

16. (a) Explain in detail the basics of different co-ordinate system and   CO1- App   (16)
        derive its relevant equations

<div align="center">Or</div>

    (b) Verify the divergence theorem for the following vector   CO1- App   (16)
        $A=xy^2 \, a_x + y^3 \, a_y + y^2 z \, a_z$ 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)

<div align="center">Or</div>

    (b) (i) Derive poisson's and Laplace equation?   CO2- App   (8)

       (ii) Find the electric field field intensity at a distance x above an   CO2- App   (8)
          infinite straight wire .

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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 CO3 - App (8)
conductors

(ii) Determine the force between two long parallel wires of 200m CO3 - App (8)
length separated by 5cm in air and carrying currents of 40A same
direction and in opposite direction

19. (a) State and derive the Maxwell's equation in Integral form and CO4- U (16)
point form for conducting medium

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)

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