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Question Paper Code: U3304

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

Third Semester

Electrical and Electronics Engineering

21UEE304 – ELECTROMAGNETIC FIELDS

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Write the theorem which converts surface integral into volume integral CO1- U
2. State Gauss Divergence theorem CO1- U
3. Define Electric Field Intensity CO2- U
4. What is the difference between electric flux density and Current density? CO2- U
5. State ampere circuital law CO3- U
6. What is the relation between poisons and laplace equations? CO3- U
7. Define conduction current density CO5- U
8. Find the maximum torque on a 100 turn square loop of a wire of 10 cm on a side that carries 15 A of current in a 2 tesla field. CO5- App
9. Define Intrinsic Impedance CO6- U
10. Define skin depth CO5- U

PART – C (5 x 16= 80 Marks)

11. (a) (i) Using Divergence theorem, evaluate $\iiint E \cdot ds = 4xz a_x - y^2 a_y + yz a_z$ over the cube bounded by $x=0, x=1, y=0, y=1, z=0, z=1$. CO1- App (8)
- (ii) Find the coordinate system which don't have any angle as its variable, and also explain the differential elements of the coordinate system with neat diagram. CO1- App (8)

Or

- (b) (i) For a vector field A , show explicitly that $\Delta \cdot \Delta \times A = 0$: that is the divergence of the curl of any vector field is zero. CO1- Ana (8)
- (ii) Find the coordinate system which consist of two angles and radius r as its parameters, and also explain the differential elements of the coordinate system with neat diagram. CO1- Ana (8)
12. (a) Two small identical conducting sphere have charges of $2nc$ and $-1nc$ respectively. When they are separated by $4cm$ apart, find the magnitude of the force between them. If they are brought into contacts and then again separated by $4cm$, find the force between them. CO2- App (16)
- Or
- (b) Apply Coulomb's law to determine the electric field intensity due to infinite line of uniform charged wire. CO2- App (16)
13. (a) Apply Biot Savart law and find the magnetic field intensity at the point p located in y axis from distance r from the origin, for infinite long straight conductor placed in Z axis. CO3- Ana (16)
- Or
- (b) At an interface separating two different magnetic materials show that the tangential component of magnetic field intensity is continuous across the boundary, whereas the normal component of magnetic field intensity is discontinuous at the boundary. CO3- App (16)
14. (a) With necessary explanation, derive the Maxwell's equation in differential and integral forms for static fields CO4- App (16)
- Or
- (b) State and explain Faraday's law of electromagnetic induction and derive the expressions for statically and dynamically induced emf. CO5- App (16)
15. (a) Obtain the electromagnetic wave equation for free space in terms of electric field and explain the wave propagation with necessary parameters CO6- App (16)
- Or
- (b) Derive an expression for pointing theorem in integral and pointing form CO6- U (16)