**Reg. No. :** | | | | | | | | | | | | |

# Question Paper Code: R3304

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Electrical and Electronics Engineering

R21UEE304 – ELECTROMAGNETIC FIELDS

(Regulations R2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

| | | | |
|---|---|---|---|
| 1. | Explain the terms differential length and differential surface in cylindrical coordinatesystem | CO1 | U |
| 2. | Infer the terms solenoidal and irrotational as applied to vector F | 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. | State Gauss Law for Magnetic field | CO3 | U |
| 7. | Contrasts Transformer EMF and Motional EMF | CO5 | U |
| 8. | For time varying field write the Maxwell equation which is derived from ampere circuitallaw | CO5 | U |
| 9. | Define Intrinsic Impedance | CO6 | U |
| 10. | State Poynting theorem and Skin Depth | CO6 | U |

PART – B (5 x 16= 80 Marks)

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|---|---|---|---|---|
| 11. | (a) | What are the types of Co-ordinate system? Apply Vector A to Cartesian Co-ordinate systems and explain in detail the Differential Elements for the same. | CO2 App | (16) |

Or

| | | | | |
|---|---|---|---|---|
| | (b) | (i) Using Divergence theorem, evaluate $\iint E.ds = 4xz\,a_x - y2\,a_y + yz\,a_z$ over the cube bounded by x=0,x=1,y=0,y=1,z=0,z=1.<br>(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. | CO2 App | (8+8) |
| 12. | (a) | Derive the Electric field intensity for charged circular ring with neat diagram | 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. | CO2 App | (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. | CO2 App | (16) |
| 14. | (a) | Contrast electricity and magnetism by comparing their laws and parameters and constants | CO3 Ana | (16) |
| | | Or | | |
| | (b) | State and explain Faraday's law of electromagnetic induction and derive the expressions for statically and dynamically induced emf | CO3 Ana | (16) |
| 15. | (a) | Obtain the electromagnetic wave equation for free space in terms of electric field and explain the wave propagation with necessary parameters | CO1 U | (16) |
| | | Or | | |
| | (b) | Derive an expression for pointing theorem in integral and pointing form | CO1 U | (16) |