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Question Paper Code : 91481

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third Semester

Electrical and Electronics Engineering

EE 6302 – ELECTROMAGNETIC THEORY

(Regulations 2013)

(Common to PTEE6302 – Electromagnetic Theory for B.E. (Part-Time) Second Semester Electrical and Electronics Engineering – Regulations 2014)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Convert the Cartesian coordinate (3, 4, 2) to Spherical coordinate.
2. Define Coulomb's law.
3. Differentiate the work done to move a charge with and without electric field.
4. Define dielectric strength.
5. Relate magnetic flux density with magnetic field intensity.
6. Relate magnetic susceptibility with relative permittivity and dielectric strength.
7. Distinguish Transformer electromotive force with motional electromotive force.
8. Write the Maxwell's equation in point form which is related to displacement current.
9. Calculate intrinsic impedance of free space.
10. Define standing wave ratio.

PART – B **(5×13=65 Marks)**

11. a) Discuss about gradient, divergence and curl in detail. Determine the divergence and curl of the given vector field **(13)**
$A = r \sin \phi \, a_r + r^2 z \, a_\phi + z \cos \phi \, a_z$

(OR)

b) Compute the Electric Flux density for a uniformly charged sphere by constructing Gaussian surface. **(13)**

12. a) Discuss about polarization in dielectrics in detail. (13)

(OR)

b) i) Discuss the nature of electric field in both conductor and dielectric material (5)

ii) Derive the expression for energy density in a electrostatic field. (8)

13. a) i) Derive the Lorentz force equation. (5)

ii) Compute the magnetic field strength due to straight conductor when flow of current along z axis. (8)

(OR)

b) i) Prove that Torque on the current loop is the vector product of force and moment arm. (5)

ii) Derive the nature of the tangential component and normal component of magnetic field strength and magnetic flux density for the boundary between two dielectric medium. (8)

14. a) Define Faraday's law. Discuss the Transformer and motional EMF. (13)

(OR)

b) i) Derive the displacement current and current density by using Ampere's law. (7)

ii) Compare and relate field theory with circuit theory. (6)

15. a) i) Derive Poynting vector and Poynting Theorem. (10)

ii) A plane wave propagating through a dielectric medium with $\varepsilon_r = 8, \mu_r = 2$ and $E = 0.5e^{-z/3} \sin(10^8 t - \beta z)a_y$ V / m

Determine Phase Constant and skin depth. (3)

(OR)

b) Derive the plane wave incidence, reflection and refraction in detail. (13)

PART – C (1×15=15 Marks)

16. a) Evaluate the Electric field Intensity at field point P due to uniform finite line charge and infinite sheet of surface charge in xy plane. (15)

(OR)

b) Analyze the characteristics of plane waves in lossless dielectric, lossy dielectric, free space and conductor. Derive the electromagnetic wave equation. (15)

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