

Reg. No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code

12057

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

Third Semester

Electrical and Electronics Engineering

20EEPC303 - ELECTROMAGNETIC THEORY

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | <i>Marks,
K-Level, CO</i> |
|---|-------------------------------|
| 1. Discuss the differential volume of cylindrical and spherical coordinate system. | 2,K2,CO1 |
| 2. Recall Divergence Theorem. | 2,K1,CO1 |
| 3. Two point charges $Q_1=100\mu\text{C}$ and $Q_2=100\mu\text{C}$ are located at points $(-1,1,-3)_m$ and $(3,1,0)_m$ respectively. Find the force acting on Q_1 . | 2,K2,CO2 |
| 4. Model the Poisson's equation. | 2,K1,CO2 |
| 5. Interpret Ampere's law. | 2,K2,CO3 |
| 6. Show the inductance of the toroid for coil of N turns. | 2,K2,CO3 |
| 7. What is meant by electromotive force? | 2,K1,CO4 |
| 8. Outline point form of ohm's law. | 2,K2,CO4 |
| 9. List the four electromagnetic wave equations. | 2,K1,CO5 |
| 10. Define Skin Depth. | 2,K1,CO5 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) With neat diagrams, explain: 13,K2,CO1
- (i) Spherical system with co-ordinates (r,θ,Φ) .
 - (ii) Cylindrical system with co-ordinates (ρ,Φ,z) .
 - (iii) Cartesian system with co-ordinates (x,y,z) .

OR

- b) Recall Gauss's law. Identify the electric field due to point charges and an infinite line charge by applying gauss law. 13,K2,CO1

12. a) (i) Model Poisson's and Laplace Equation. 7,K2,CO2
(ii) Derive the relationship between polarization and electric field intensity. 6,K2,CO2

OR

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

12057

- b) (i) Analyze the expression for capacitance of a spherical capacitor. 7,K3,CO2
(ii) If two parallel plates of area 4m^2 are separated by a distance 6mm, find the capacitance between two plates. If a rubber sheet 4mm thick with $\epsilon_r=2.4$ is introduced in between the plates leaving a gap of 1mm on both sides, determine the capacitance. 6,K3,CO2

13. a) Demonstrate the mathematical form of Biot-Savart's Law. Apply it to find the magnetic field intensity due to 13,K3,CO3
(i) An infinite current carrying conductor.
(ii) Centre of toroid

OR

- b) Model the magnetic boundary conditions at the interface between the magnetic materials. 13,K3,CO3
14. a) Develop Maxwell's equations in differential form and integral form 13,K2,CO3
OR
b) Analyze the transformer and motional electromotive force in the following conditions. 13,K2,CO4
a) Stationary loop in time varying magnetic field.
b) Time varying loop in a static magnetic field.

15. a) Discuss the reflection and transmission of wave at normal incidence. 13,K2,CO5

OR

- b) Show the mathematical equation of Poynting theorem. List the significance of each term. 13,K2,CO5

PART - C (1 × 15 = 15 Marks)

16. a) A 1.8KHz wave propagates in a medium characterized by $\mu_r=1.6, \epsilon_r=25$ and conductivity $\sigma=2.5\text{s/m}$. The electric field intensity in the region is given by $E=0.1e^{-\alpha z}\cos(2\pi ft-\beta z)\text{V/m}$. Determine the attenuation constant, propagation constant, intrinsic impedance, phase velocity, skin depth and wave length of the wave. 15,K3,CO5

OR

- b) Apply Divergence theorem evaluate $\int \vec{A} \cdot \vec{d}\vec{s}$ where 15,K3,CO1
 $\vec{A} = 2xy\vec{a}_x + y^2\vec{a}_y + 4yz\vec{a}_z$ and S is the surface of the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.