Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER ARREAR EXAMINATIONS, May 2025

DEPARTMENT OF ELECTRICAL AND ELECRONICS ENGINEERING

Semester III

EE5302 ELECTROMAGNETIC THEORY

(Regulation 2019)

Time: 3hrs Max .Marks: 100

CO 1	Ability to identify appropriate coordinate systems and visualize and understand the practical significance of vector calculus
CO 2	Understanding of the basic laws of electromagnetism
CO 3	Ability to compute, visualize electrostatic and magneto static fields along with practical applications
CO 4	Understanding of Maxwell's equations in different forms and media
CO 5	Able to understand the concept of generation and propagation of electromagnetic waves through single and multiple media.

BL – Bloom's Taxonomy Levels

(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analyzing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Give some practical applications of electromagnetic fields	2	CO1	L2
2	Represent point P(0,1,1)m given in Cartesian co-ordinates in spherical co-ordinates	2	CO1	L2
3	Find the electric potential at a point (4,3) m due to a charge of 10^{-9}C located at the origin in free space.	2	CO2	L5
4	Draw the distribution of electric field intensity and potential in a single shell of charges.	2	CO2	L1
5	Define self and mutual inductance?	2	CO3	L1
6	Given Q_1=20μC situated at (0,1,2) and Q_2= -300 μC situated at(2,0,0), find the force in Newton on Q_1due to Q_2.	2	CO3	L5
7	Distinguish between displacement current and conduction current.	2	CO4	L2
8	Find the characteristics impedance of the medium whose relative permittivity is 2.6 and relative permeability is 1.	2	CO4	L5
9	Define reflection coefficient of electromagnetic wave	2	CO5	L1
10	What is the skin depth of a 3mm radius aluminium round conductor operating at 100Hz and 5MHz the conductively of aluminium is 3.55 x 10^{-7} S/m.	2	CO5	L5

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a)	If **G** (r) = $10e^{-2z}$ ($p\mathbf{a}_\rho + \mathbf{a}_z$), determine the flux of **G** out of the entire surface of the cylinder ρ = 1, 0 ≤ z ≤ 1. Confirm the result by using the divergence theorem.	13	CO1	L3
	OR			
11 (b) (i)	State and prove the Stoke's theorem	5	CO1	L3

(ii)	Using Gauss Law, evaluate the capacitance of a co-axial cable and spherical capacitor	8	CO1	L3
12 (a)	Explain dielectric polarization and hence obtain an expression for electric field intensity and potential of a dipole.	13	CO2	L2
	OR			
12 (b)	Obtain an expression for electric field intensity and potential at any point due to a charged circular disc	13	CO2	L2
13 (a)	Explain the Magnetic vector potential and derive an expression for the same	13	CO3	L4
	OR			
13 (b)	Derive the magnetic field intensity and magnetic flux density at any point along the axis of solenoid	13	CO3	L4
14 (a)	Obtain an expression for the **H** in an infinitely long co-axial Transmission line and thus plot H_ϕ against ρ	13	CO4	L4
	OR			
14 (b)	Derive the set of Maxwell's equation in integral form for a conductor using fundamental Laws.	13	CO4	L4
15 (a)	Obtain an expression for the Power density vector associated with electromagnetic fields at a given point.	13	CO5	L4
	OR			
15 (b)	Explain how electromagnetic waves are generated and thus obtain an expression for electromagnetic wave equation for perfect conductor in terms of magnetic fields?	13	CO5	L4

PART- C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	With case studies prove the practical significance of Electo-magnetic boundary conditions.	10	CO3	L6
(ii)	Obtain the continuity equation from field theory concept.	5	CO4	L2

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