Course Code: 23ES3T02

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

II-B.Tech I-Semester Regular Examinations (BR23), November -2024

ELECTROMAGNETIC FIELD THEORY (EEE)

Time: 3 hours Max. Marks: 70

Question Paper consists of Part-A and Part-B

*Answer **ALL** the question in **Part-A and Part-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Define the term electric field intensity E.	(2M)	CO1	BL1
b)	State Gauss law. List the applications of Gauss law.	(2M)	CO1	BL1
c)	Write Laplace's equations starting from Gauss's law.	(2M)	CO2	BL1
d)	State the continuity equation	(2M)	CO2	BL1
e)	Explain about convection and conduction currents.	(2M)	CO3	BL2
f)	State Ampere's circuital law	(2M)	CO3	BL1
g)	Define the terms mutual inductance and self-inductance.	(2M)	CO4	BL1
h)	A solenoid has an inductance of 20 mH. If the length of the solenoid is increased by two times and the radius is decreased to half of its original value, find the new inductance	(2M)	CO4	BL1
i)	Write Maxwell's fourth equation.	(2M)	CO5	BL1
j)	List the differences between statically and dynamically induced emf.	(2M)	CO5	BL1

PART–B (5X10 = 50M)

2a.	A) State and explain Coulomb's law of electrostatic field in vector form.	5(M)	CO1	BL2
b.	Three equal point charges of 2μC are in free space at (0,0,0), (2,0,0) and (0,2,0), respectively. Find net force on Q4=5μC at (2,2,0)	5(M)	CO1	BL1
	(OR)			
3a.	Derive an expression for the electric field intensity due to a finite length line charge along the Z-axis at an arbitrary point Q(x,y,z).	10(M)	CO1	BL3

4a.	Explain about Ohm's law in point form.	5(M)	CO2	BL2
b.	Derive the boundary conditions for between two dielectrics.	5(M)	CO2	BL3
	(OR)			
5a.	Prove that electric field intensity is equal to the negative gradient of the potential, i.e., E = - ∇ V.	5(M)	CO2	BL3
b.	Derive the maxwell's first equation.	5(M)	CO2	BL3

UNIT-III

6a.	Derive the expression for magnetic field intensity due to infinitely long straight Filament carrying a direct current I?	5(M)	CO3	BL3
b.	Deduce the Biot-Savart's law from Ampere's circuital law.	5(M)	CO3	BL3
	(OR)			

7a.	Derive Maxwell's third equation?	5(M)	CO3	BL3
b.	Obtain the expression for torque on a current loop placed in a magnetic field?	5(M)	CO3	BL3

UNIT-IV

8a.	Explain about Mutual Inductance between two coupled inductors?	5(M)	CO4	BL2
b.	Find the inductance of an ideal solenoid with 300 turns, length L=0.50m and a circular cross section of radius 0.02m.	5(M)	CO4	BL1
	(OR)			
9a.	Obtain an expression for the self-inductance of a toroid of circular cross section With 'N' closely spaced turns?	5(M)	CO4	BL3
b.	Find the mutual inductance between two toroidal windings which are closely wound on iron core of relative permeability 900. The mean radius of the core is 5cm and radius of its cross-section is 5cm. Each winding has also 800 turns.	5(M)	CO4	BL1

UNIT-V

10a	Describe the Poynting theorem and derive its necessary expression?	5(M)	CO5	BL2
b.	Write the Maxwell's equations for harmonically varying fields?	5(M)	CO5	BL1
	(OR)			
11a	Explain about Faraday's laws of electromagnetic induction.	5(M)	CO5	BL2
b.	Discuss in brief about statically and dynamically induced EMF.	5(M)	CO5	BL2

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