R22 Regulation *Subject code:4E3BE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech III Semester Supplementary Examinations, June 2026

ELECTRO MAGNETIC FIELDS

(EEE)

Maximum Marks: 60 Date:20.06.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1.a)	Distinguish between scalar and vector quantities.	1M	1	2
b)	What are orthogonal coordinate systems? Give examples.	1M	1	2
c)	State Coulomb's Law and mention its limitations.	1M	2	2
d)	Define different charge distributions	1M	2	1,2
e)	State Biot-savant's law.	1M	3	3
f)	Differentiate between conductors and insulators.	1M	3	2
g)	Define Mutual -inductance.	1M	4	4
h)	What is Displacement current?	1M	4	4
i)	What are uniform plane waves?	1M	5	2
j)	Define characteristic impedance or intrinsic impedance	1M	5	2,3

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	Derive the expression for divergence in spherical coordinates.	10M	1	4
	OR			
3	Derive differential length, area, and volume in cylindrical coordinates.	10M	1	4
4	a) Obtain an expression for electric field intensity due to infinite surface charge sheet. b) Point charges Q_1 and Q_2 are respectively located at (4, 0, -3) and (2, 0, 1). if Q_1=4nC find another point charge when i) Electric field intensity on a charge at a point (5, 0, 6) has no z-component. ii) Force on a charge at a point (5,0,6) has no x-component.	5M 5M	2 2	3 3
	OR			
5	a) State and prove 'Gauss's law' in electrostatics b) Derive the expression for the Energy Density in Electrostatics.	5M 5M	2 2	5 4

6	a) A parallel plate capacitor consists of two square metal plates with 500mm side & separated 10mm. A slab of Sulphur (ε_r=4) 6mm thick is placed on the lower plate & air gap of 4mm. Find the capacitance of capacitor? b) Derive an expression for H in case of Solonoid and Toroid using Amperes circuit law?	5M 5M	3 3	3 3
	OR			
7	State Biot-savart's law and derive an expression for H of infinitely long straight conductor with line current placed along z-axis?	10M	3	5
8	a) Derive an expression for force due to magnetic field on a moving charged particle? b) Prove magnetic force due to current element is **F=BIlsinθ**?	5M 5M	4 4	3 4
	OR			
9	Derive the inductance of Solenoid& Toroid?	10M	4	3
10	Write and explain differential and integral forms of Maxwell's equations for fields varying hormonally with time.	10M	5	3
	OR			
11	Explain wave propagation in free space and derive the necessary equations.	10M	5	4