SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech. II Year I Semester Regular&Supplementary Examinations November-2025
ELECTROMAGNETIC FIELD THEORY
(Electrical & Electronics Engineering)

Time: 3 Hours   Max. Marks: 70

PART-A
(Answer all the Questions 10 x 2 = 20 Marks)

1	a	Define stokes theorem.	CO1	L1	2M
	b	Describe the relationship between potential gradiant and electric field.	CO1	L2	2M
	c	Define dielectric strength.	CO2	L1	2M
	d	Describe the expression for energy density in electrostatic field.	CO2	L1	2M
	e	Give the expression for torque experienced by a current carrying loop situated in a magnetic field.	CO3	L1	2M
	f	Define magnetic moment.	CO3	L1	2M
	g	Describe the expression for energy stored in a magnetic field.	CO5	L2	2M
	h	Describe the energy density in magnetic field.	CO5	L1	2M
	i	Write Maxwell equations in time varying fields?.	CO6	L1	2M
	j	Define pointing vector.	CO6	L1	2M

PART-B
(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2	a	Determine whether or not the following potential fields satisfy the Laplace's equation $V=x^2-y^2+z^2$ & ii) $V=r \cos\phi +z$.	CO1	L3	5M
	b	Derive Laplace's and Poisson's Equation.	CO1	L4	5M

OR

3		Find the gradient of the following scalar fields:	CO1	L3	10M
		i) $V=e^{-z}\sin 2x \cosh y$, ii) $U=r^2 z \cos\phi$ and iii) $W= 10r \sin^2\theta\cos\phi$			

UNIT-II

4		Explain the phenomenon of polarization when a dielectric slab is subjected to an electric field.	CO2	L4	10M

OR

5	a	Find the magnitude of D and P for a dielectric material in which E=0.15 mV/m and χ_e=4.25.	CO2	L3	5M
	b	Find the polarization in dielectric material with ε_r =2.8 if D=3*10^{-7} C/m²	CO2	L3	5M

UNIT-III

6	a	Write the expression for magnetic field H at the center of a circular coil carrying a current of I amperes. The radius of the coil is a 'm'.	CO4	L4	5M
	b	Define Magnetic dipole and derive Magnetic torque and Magnetic moment between two magnetic dipoles.	CO4	L2	5M

OR

7		A Point charge of Q=1.2 C has a velocity V=(5 a_x +2 a_y -3a_z)m/s. Find the magnitude of the force exerted on the charge if	CO4	L4	10M
	i)	E= -18 a_x +5 a_y -10 a_z V/m and ii) B=-4 a_x +4 a_y +3 a_z T,			
	ii)	iii) Both are present simultaneously.			

UNIT-IV

8		The core of a toroid is of 12 cm² area and is made up of material with μ_r = 200. If the mean radius of the toroid is 50 cm, Calculate the number of turns needed to obtain an inductance of 2.5 H.	CO5	L3	10M

OR

9		Derive the expression for Mutual inductance between a long, straight wire and Rectangular Loop Laying in same Plane.	CO5	L4	10M

UNIT-V

10		Derive an expression for motional and transformer induced EMF.	CO6	L4	10M

OR

11		Write Maxwell's equation in good conductors for time varying fields and static fields both in differential and integral form.	CO6	L4	10M

*** END ***