PVP 23

Code: 23ES1301

II B.Tech - I Semester – Regular Examinations - DECEMBER 2024

ELECTROMAGNETIC FIELD THEORY
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Define Electric Flux?	L1	CO1
1.b)	State Coulomb's law.	L1	CO1
1.c)	Discuss Electric dipole moment.	L2	CO2
1.d)	Explain polarization. Is polarization present in conductors?	L2	CO2
1.e)	What is meant by boundary condition? How they are useful?	L2	CO3
1.f)	Classify the fundamental difference between static electric and magnetic field lines?	L2	CO3
1.g)	Indicate the expression for Lorentz force equation and write its significance.	L2	CO4
1.h)	Define mutual inductance.	L1	CO4
1.i)	Cite the integral and point forms of Faraday's laws.	L2	CO5
1.j)	Define Poynting vector.	L1	CO5

PART – B

			BL	CO	Max. Marks
		UNIT-I			
2	a)	Illustrate the electric field intensity due to infinite line charge, at a point perpendicular to its plane and at a given distance from the line charge from first principles.	L4	CO1	5 M
	b)	Solve the electric field intensity at distance 'z' above the center of a flat circular disc of radius 'r', which carries a uniform surface charge.	L3	CO1	5 M
		OR			
3	a)	Illustrate the Relationship between electric field and electric potential.	L3	CO6	5 M
	b)	A Charge of -0.3 μC is located at A(25, -30, 15) cm and a second charge of 0.5 μC is at B(-10, 8, 12) cm. Find **E** at (i) the origin (ii) P(15, 20, 50) cm.	L3	CO6	5 M
		UNIT-II			
4		What is meant by electric dipole? Develop the expression for electric field intensity due to electric dipole.	L2	CO2	10 M
		OR			
5		Two dipoles with dipole moments -5 a_z nC/m and 9 a_z nC/m are located at points (0, 0, -2) and (0, 0, 3) respectively. Find the potential at the origin.	L3	CO2	10 M

UNIT-III					
6	a)	A parallel plate capacitor consists of three dielectric layers. If $\varepsilon_{r1}=1, d_1=0.4mm$, $\varepsilon_{r2}=2$, $d_2=0.6mm$, $\varepsilon_{r3}=3$, $d_3=0.8mm$ and area of cross section $20cm^2$. Find capacitance.	L3	CO3	5 M
	b)	Derive the expressions for the capacitance of a parallel plate capacitor and the energy stored in it.	L4	CO3	5 M
OR					
7	a)	A filamentary current of 15A is directed in from infinity to the origin on the positive x axis and then back out to infinity along the position y axis. Use the Biot-Savart's law to find *H* at P (0, 0, 1)	L3	CO3	6 M
	b)	Estimate the magnetic field intensity at centre of a square of sides equal to 5m and carrying a current equal to 10 A.	L2	CO3	4 M
UNIT-IV					
8	a)	Explain that the force between two parallel conductors carrying current in the same direction is attractive.	L2	CO4	5 M
	b)	If the magnetic field intensity $H=(0.01/\mu_0)$ A/m, What is the force on a charge of 0.1pC moving with a velocity of 10^6 a_x m/s.	L3	CO4	5 M
OR					

9	a)	Derive the expression for self-inductance of a coaxial cable of inner radius ‘a’ and outer radius ‘b’.	L4	CO4	5 M
	b)	Determine the inductance of a solenoid of 2500 turns wound uniformly over a length of 0.25m on a cylindrical paper tube, 4 cm in diameter and the medium is air.	L3	CO4	5 M
UNIT-V					
10	State the Poynting Theorem and derive the necessary expressions.		L4	CO5	10 M
OR					
11	Derive the Maxwell’s fourth equation for time varying fields.		L4	CO5	10 M