Reg. No.															

Question Paper Code	13524

B.E. / B.Tech. - DEGREE EXAMINATIONS, APR / MAY 2025

Third Semester

Electrical and Electronics Engineering

20EEPC303 - ELECTROMAGNETIC THEORY

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following are the Natural sources of electric and magnetic fields? (a) The Earth's Magnetic Field (b) Lightning (c) Visible light (d) All of the mentioned	1	K1	CO1
2.	If F is the force acting on the test charge 'Q' the electric field intensity E would be given by (a) E=F-Q (b) E=FQ (c) E=F/Q (d) E=Q/f	1	K1	CO1
3.	Which statement about the electric field in a conductor in electrostatic equilibrium is true? (a) The electric field is zero everywhere inside the conductor. (b) The electric field is non-zero everywhere inside the conductor. (c) The electric field is maximum at the center of the conductor. (d) The electric field varies linearly inside the conductor.	1	K1	CO2
4	How does dielectric strength relate to an insulating material? (a) It is the ability to conduct electric current. (b) It is the maximum electric field an insulating material can withstand without breaking down. (c) It is the resistance offered by the material to the electric flow. (d) It measures the material's capacitive nature.	1	K1	CO2
5.	What does the Lorentz force law describe? (a) The force on a magnetic field due to a current. (b) The force on a charged particle due to electric and magnetic fields. (c) The force between two magnetic poles. (d) The resistance in a magnetic circuit.	1	K1	CO3
6.	What does the term 'inductance' refer to? (a) The ability of a conductor to resist changes in voltage. (b) The ability of a conductor to resist changes in current. (c) The capacity of a capacitor to store charge. (d) The resistance of a conductor to electric flow.	1	K1	CO3
7.	What is motional EMF? (a) EMF generated due to the motion of a conductor in a magnetic field. (b) EMF generated due to motion of charges in a circuit. (c) EMF induced in a stationary conductor. (d) A constant voltage source in a circuit.	1	K1	CO4
8.	What role does the displacement current play in Maxwell's equations? (a) It helps equate the continuity equation for changing electric fields. (b) It negates the need for magnetic fields. (c) It provides a basis for resistive circuits. (d) It reduces the total current in a circuit.	1	K1	CO4

9.	What defines the propagation constant of a wave? (a) The rate at which the wave's amplitude increases. (b) The rate at which the wave's amplitude decreases. (c) The phase shift per unit length. (d)The frequency shift per unit length.		*1*	*K1*	*CO5*
10.	What happens to the speed of electromagnetic waves as they enter a medium with higher permittivity? (a) It increases (b) It decreases (c) It remains constant (d) It becomes zero		*1*	*K1*	*CO5*

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	State Stoke's theorem and its application.	*2*	*K1*	*CO1*
12.	State the coulomb's law.	*2*	*K1*	*CO1*
13.	List out Applications of Gauss Law.	*2*	*K1*	*CO1*
14.	Define polarization.	*2*	*K1*	*CO2*
15.	Write the equation for capacitance of coaxial cable with solid inner conductor.	*2*	*K1*	*CO2*
16.	Compare I_C and I_D.	*2*	*K2*	*CO2*
17.	State Ampere's circuital law.	*2*	*K1*	*CO3*
18.	Distinguish between magnetic scalar potential and magnetic vector potential.	*2*	*K2*	*CO3*
19.	Define coupling coefficient.	*2*	*K1*	*CO4*
20.	Distinguish between transformer emf and motional emf.	*2*	*K2*	*CO4*
21.	Define surface impedance.	*2*	*K1*	*CO5*
22.	State Slepian vector.	*2*	*K1*	*CO5*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	State and derive the divergence theorem.	*11*	*K2*	*CO1*
		OR			
	b)	By means of gauss's law, determine the electric field intensity inside and outside a spherical shell of radius R that contains a total charge Q uniformly distributed over the surface.	*11*	*K2*	*CO1*
24.	a)	At an interface separating dielectric medium 1(εr_1) and dielectric medium 2(εr_2), Apply Boundary Conditions and show that the tangential component of **E** is continuous across the boundary, whereas the normal component of **D** is discontinuous at the boundary.	*11*	*K3*	*CO2*
		OR			
	b)	Drive an expression for energy stored and energy density in electrostatic field.	*11*	*K3*	*CO2*
25.	a)	Obtain an expression for the magnetic flux density and field intensity due to finite long current carrying conductor using Biot Savart's law.	*11*	*K3*	*CO3*
		OR			
	b)	Derive an expression for the inductance per meter length of two transmission lines.	*11*	*K3*	*CO3*
26	a)	Derive and explain the Maxwell's equations in point form and integral form using Ampere's circuital law and Faraday's law.	*11*	*K3*	*CO4*
		OR			
	b)	Derive the expression for relationship of circuit theory and field theory series RLC circuit.	*11*	*K3*	*CO4*
27.	a)	State and prove poynting theorem and poynting vector.	*11*	*K2*	*CO5*
		OR			
	b)	Explain and derive the reflection coefficient of oblique incidence in perfect dielectric for parallel polarization.	*11*	*K2*	*CO5*

28.	a) (i)	Compare the field theory and circuit theory.	*6*	*K2*	*CO4*
	(ii)	Define depth of penetration. Derive its expression.	*5*	*K2*	*CO5*
		OR			
	b) (i)	Compare the energy stored in inductor and capacitor.	*6*	*K2*	*CO4*
	(ii)	Define Brewster angle and derive its expression.	*5*	*K2*	*CO5*