Reg. No.																

Question Paper Code	13968

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Third Semester

Electrical and Electronics Engineering

24EEPC301 - ELECTROMAGNETIC FIELDS

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which theorem would you apply to evaluate the integral of a vector field around a closed loop? a) Gauss's theorem b) Green's theorem c) Stokes' theorem d) Fourier's theorem	1	K1	CO1
2.	Which of the following are the Human-made sources of electromagnetic fields? a) vacuum cleaners b) hair-dryers c) refrigerators d) All of the mentioned	1	K1	CO1
3.	What is the value of total electric flux coming out of a closed surface? a) Equal to the total charge enclosed by the surface. b) Equal to the surface charge density. c) Equal to volume charge density. d) Zero	1	K1	CO2
4.	An infinite sheet of charge has a uniform surface charge density σ. What is the direction of the electric field above the sheet? a) Radially inward b) Radially outward c) Parallel to the surface d) Zero electric field	1	K1	CO2
5.	What is the direction of the magnetic field at the center of a circular current-carrying loop? a) Tangential to the loop. b) Radial to the loop. c) Perpendicular to the plane of the loop. d) Parallel to the plane of the loop.	1	K1	CO3
6.	What does Biot-Savart's Law enable one to calculate? a) The magnetic field created by a moving charged particle. b) The force between two parallel conductors. c) The inductance of a closed circuit. d) The capacitance between two plates	1	K1	CO3
7.	Maxwell's equations unified which of the following aspects of physics? a) Electricity and Magnetism b) Gravity and Motion c) Thermodynamics and Optics d) Kinetics and Potential Energy	1	K1	CO4
8.	Which component is essential for the functioning of magnetic circuits but not electrical circuits? a) Resistor b) Capacitor c) Core material d) Inductor	1	K1	CO4
9.	In which medium do electromagnetic waves travel the fastest? a) Vacuum b) Water c) Glass d) Air	1	K1	CO5
10.	The human body model (HBM) is used for a) Measuring inductance b) Simulating ESD Event c) Measuring capacitance of IC's d) Testing Battery performance	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	State the conditions for a vector A to be (a) solenoidal (b) irrotational.	2	K2	CO1
12.	Infer the two vectors A=$3\overrightarrow{ax}+\overrightarrow{ay}-5\,\overrightarrow{az}$ and B= $\overrightarrow{ax}+\overrightarrow{ay}-\overrightarrow{az}$ are perpendicular to each other.	2	K2	CO1
13.	State the relation between electric field intensity and potential.	2	K1	CO2

14.	Identify the force of interaction between two charges 4 x 10^{-8} and 8 x 10^{-5} spaced 10cm apart in kerosene($\varepsilon_r = 2$).	2	K3	CO2
15.	State Faraday's law of electromagnetic induction.	2	K2	CO3
16.	Find the value of magnetic field intensity at the centre of a circular loop of radius 1m carrying a current of 10 A.	2	K1	CO3
17.	Compare between the conduction current and displacement current.	2	K2	CO4
18.	Write the point form of continuity equation and explain its significance.	2	K1	CO4
19.	State Snell's law.	2	K2	CO5
20.	Write the wave equation in a conducting medium.	2	K1	CO5
21.	What is magnetic levitation?	2	K1	CO6
22.	List out application of RF MEMS.	2	K1	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Make use of the divergence theorem, Solve where F=2xy a_x+ y^2 a_y +4yz a_z and S is the surface of the cube bounded by x=0, x=1; y=0, y=1; and z=0, z=1.	11	K3	CO1
		OR			
	b)	Identify and Transform a rectangular coordinate vector A=4a_x -2a_y+ 3 a_z into a cylindrical and spherical coordinate system at point P (1,-3,2).	11	K3	CO1
24.	a)	Analyze the electric field intensity at a point P distant 'h' m from an infinite line of uniform charge ρ_1 C/m using gauss's law.	11	K4	CO2
		OR			
	b)	A circular disc of 10 cm radius is charged uniformly with a total charge10c. Analyze the electric field at a point 30 cm away from the disc along the axis.	11	K4	CO2
25.	a)	Apply the Bio- Savart's law to derive the expression for magnetic field intensity on the axis of solenoid at a) entering point of the solenoid b) center of the solenoid.	11	K3	CO3
		OR			
	b)	Develop an expression for boundary conditions in magnetic fields B and H at the plane interface between two media.	11	K3	CO3
26.	a)	Compare electrical circuit theory and magnetic field theory.	11	K4	CO4
		OR			
	b)	Analyze and develop the Maxwell's equations in point form and integral form using Ampere's circuital law and electric gauss's law.	11	K4	CO4
27.	a)	Simplify the electromagnetic wave equation for free space in terms of electric field and magnetic field.	11	K4	CO5
		OR			
	b)	Analyze from Maxwell equation; derive the integral form of poynting theorem for an arbitrary volume bounded by surface.	11	K4	CO5
28.	a)	Apply the working principle of RF MEMS switches and RF based communication systems.	11	K3	CO6
		OR			
	b)	Demonstrate how wireless power transfer can be applied to charge electric vehicles.	11	K3	CO6