Number) Enrollment No. 12401820025

End-Term Examination

(CBCS)(SUBJECTIVE TYPE)(OffLine)

B.Tech ECE, IVth Sem

(May, 2025)

Subject Code: BEC 206	Subject: Electromagnetic Field Theory
Time :3 Hours	Maximum Marks :60

Note: Q1 is compulsory. Attempt one question each from the Units I, II, III & IV.

Q1		(2.5*8=20)	CO Mapping
	a) What do you mean by Magnetic Flux density?		CO 3
	b) What do you mean by displacement current?		CO 4
	c) Define Laplace's equation and state its general form in Cartesian coordinates.		CO 2
	d) Define skin depth. Derive its relation with attenuation constant.		CO 2
	e) Discuss magnetic scalar and vector potential.		CO 3
	f) State stokes theorem along with its mathematical expression.		CO 1
	g) A lossy material has $\mu = 5\mu_o$, $\varepsilon = 2\varepsilon_o$. If at 5 MHz, the phase constant is 10 rad/m, calculate the loss tangent.		CO 2
	h) Give Maxwell's equations in differential and integral form.		CO 4
	UNIT I		CO Mapping
Q2	State Divergence Theorem. Verify the divergence theorem for the function $A = r^2 a_r + r \sin\theta \cos\phi\, a_\theta$ over the surface of a quarter of a hemisphere defined by $0 < r < 3$, $0 < \phi < \pi/2$, $0 < \theta < \pi/2$	(10)	CO 1
Q3	Given point P (−2,6,3) and vector $A = y\, a_x + (x+z)\, a_y$ express P and A in cylindrical and spherical coordinates. Evaluate A at P in the Cartesian, cylindrical, and spherical systems.	(10)	CO 1
	UNIT II		CO Mapping
Q4	(a) State the differential form of Gauss's Law in terms of electric flux density. Explain its significance. (b) Determine electric flux density D at (4,0,3) if there is a point charge -5π mC at (4,0,0) and a line charge 3π mC/m along the y-axis.	(10)	CO 2
Q5	(a) Derive the relationship between E and V. (b) Using boundary conditions, prove that the tangential component of the electric field remains continuous across the boundary between two dielectric media.	(10)	CO 2
	UNIT III		CO Mapping
Q6	(a) Derive Ampere's law. What are the characteristics of a static magnetic field? (b) Discuss law of conservation of magnetic flux. Explain why magnetic monopole does not exist.	(10)	CO 3
Q7	Discuss Biot Savart's law. From it, derive magnetic field intensity H due to line, surface and volume current distributions.	(10)	CO 3
	UNIT IV		CO Mapping
Q8	(a) Discuss any two applications of transmission lines with suitable figures. (b) An air line (loss less) has characteristic impedance of 70 Ω and phase constant of 3 rad/m at 100 MHz. Calculate the inductance per meter and the capacitance per meter of the line.	(10)	CO 4
Q9	State Poynting theorem and its significance. Derive the mathematical expression for Poynting theorem.	(10)	CO 4