Register No: _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Fourth Semester

Electronics and Communication Engineering

EC3452 - Electromagnetic Fields

Regulations - 2021

Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	State Stoke's theorem.	L1	1	2
2.	Determine the gradient of the scalar field$F = 5r^2 + rsin\theta$.	L3	1	2
3.	State Coulomb's law of electrostatic charges.	L1	2	2
4.	Identify equation of Ohm's law in point form.	L1	2	2
5.	Point out the relation between magnetic flux density and magnetic field intensity.	L2	3	2
6.	Classify the different types of magnetic materials.	L2	3	2
7.	Outline the difference between conduction current and displacement current.	L2	4	2
8.	Point out on the phenomenon of electromagnetic induction.	L1	4	2
9.	State Poynting theorem.	L1	5	2
10.	Identify the relationship between average power density and amplitude of electric field.	L2	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16= 80)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a		Solve vector B in Cartesian and cylindrical systems. Given $= \frac{10}{r}\overrightarrow{a_r} + r\cos\theta + \overrightarrow{a_\varphi}$, Then find B at (-3, 4, 0) and (5, $\frac{\pi}{2}$, -2).	L3	1	16
			Or			
	b		Given that $D = \left[\frac{5r^2}{4}\right]\overrightarrow{a_r}\ (C/m^2)$ in spherical coordinates, evaluate both sides of divergence theorem for the volume enclosed by r = 4 m and $\theta = \frac{\pi}{4}$.	L4	1	16
12.	a	i	Explain any two applications of Gauss law with neat diagrams.	L3	2	10
		ii	Explain about nature of dielectric material and polarization.	L2	2	6
			Or			
	b	i	A cylindrical capacitor consists of an inner conductor of radius 'a' & an outer conductor whose inner radius is 'b'. The space between the conductors is filled with a dielectric permittivity Ɛr & length of the capacitor is L. Estimate the value of the Capacitance.	L3	2	10
		ii	Write the equation of continuity in integral and differential form.	L2	2	6

13.	a		From the Biot-Savart law, write the expression for magnetic field intensity at a point P and distance R from the infinitely long straight current carrying conductor.	L3	3	16
			Or			
	b		Derive the expression for Ampere circuital law. Apply the law for any two applications with necessary illustrations.	L3	3	16
14.	a		Derive the Maxwell's equation in integral and differential form.	L3	4	16
			Or			
	b	i	Demonstrate the detailed steps for the derivation of electromagnetic boundary conditions for a time varying fields.	L3	4	8
		ii	Determine emf induced about the path r = 0.5, z = 0, t = 0. If B = 0.01sin377t.	L3	4	8
15.	a		Demonstrate the equations for a plane wave incident normally on a plane dielectric boundary.	L3	5	16
			Or			
	b		Estimate the frequency of a wave and the conductivity of the medium for a uniform plane wave travelling at a velocity of $2.5*10^5$ m/s having a wavelength of 0.25 mm in a non-magnetic good conductor.	L3	5	16