Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 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 divergence theorem.	L1	1	2
2.	$\bar{A} = 2\overline{a_x} - 5\overline{a_y} - 4\overline{a_z}$ and $\bar{B} = 3\overline{a_x} + 5\overline{a_y} + 2\overline{a_z}$. Infer the dot product.	L2	1	2
3.	Illustrate Gauss's law.	L1	2	2
4.	Write the Laplace equation and its application.	L1	2	2
5.	What is magnetic vector potential?	L1	3	2
6.	Relate the expression for the Lorentz force equation for a moving charge?	L2	3	2
7.	Find the e.m.f induced along the path r=0,5, z=0 and t=0. If $\bar{B} = 0.01Sin377t\ T$.	L2	4	2
8.	Mention the significance of displacement current?	L2	4	2
9.	What is group velocity?	L1	5	2
10.	Define skin depth and state its significance.	L1	5	2

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

Q.No			Questions	BLT	CO	Marks
11.	a	i	Interpret about electric field intensity due to various charge distributions in line, surface and volume.	L2	1	8
		ii	Given three points in Cartesian coordinate system as A(3,-2,1)B(-3,-3,5) C(2,6,-4). Model the value of vector from A to C, distance from B to C and the vector from A to the midpoint of the straight line joining B to C.	L3	1	8
			Or			
	b	i	What would result in the electric field at a distance z above the center of a flat circular disc of radius R, which carries a uniform surface charge σ.	L2	1	8
		ii	The flux density $\bar{D} = \frac{r}{3}\overline{a_r}\ nC/m^2$is in the free space. Calculate $\bar{E}$ at	L3	1	8

	i	r=0.2m and the total electric flux leaving the sphere of r=0.2m.			
12.	a	Define gauss law. Analyze how the electric flux through a closed surface changes when the charge enclosed by the surface is doubled. How does this affect the application of Gauss's Law?	L4	2	16
		Or			
	b	Derive the expression for the potential difference due to infinite line charge. A uniform line charge of 0.8nC/m lies along the z axis in free space. Calculate the potential at P(2,3,4) if the potential at Q(1,7,2) is zero.	L4	2	16
13.	a	State and prove Ampere's Circuit law. A flat perfectly conducting surface in x-y plane is situated in a magnetic field, $\overline{H} = 3cosx\overrightarrow{a_x} + zcosx\overrightarrow{a_y}\ A/m$ for z ≥0 and zero for z<0. Analyze the current density on the conductor surface.	L3	3	16
		Or			
	b	Derive the magnetic boundary conditions at the interface between two different magnetic medium for different permeabilities.	L3	3	16
14.	a	Make use of suitable basic laws to develop the Maxwell's equation in point form and integral form.	L3	4	16
		Or			
	b	Develop the expression for the boundary conditions between a dielectric medium and a perfect conductor for time varying case.	L3	4	16
15.	a	Explain in detail on what happens when the wave is incident Normally on perfect conductor and Obliquely to the surface of perfect dielectrics.	L2	5	16
		Or			
	b	Derive the relationship between electric field and magnetic field. Derive the wave equation for magnetic field in phasor form.	L2	5	16