

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024****Subject Code:2151002****Date:25-11-2024****Subject Name:Engineering Electromagnetics****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Explain the difference between vector and vector field with suitable example.	03
	(b) Given point P (2,3,-1) and Q (4, 25 ⁰ , 120 ⁰) Find the spherical coordinate of P and Cartesian coordinate of Q.	04
	(c) Define the cross product and explain its properties and applications.	07
Q.2	(a) Derive the electric field intensity and electric flux density due to infinite and uniform line charge density.	07
	(b) Find E at P (1,5,2) m in free space if a point charge of 5 μC is located at (0,0,1), the uniform line charge density $\rho_L = 150 \text{ nC/m}$ along x axis and uniform sheet of charge with $\rho_s = 20 \text{ nC/m}^2$ over the plane $z = -1$.	07
	OR	
	(b) Determine the electric field intensity at P (2,0,3) m due to a point charge of 5 nC at Q (2,0,5) m in air.	07
Q.3	(a) State and explain Gauss's Law and point form of Gauss's Law.	07
	(b) Obtain the volume charge density at the point P (2,110 ⁰ , -1) for the given flux density, $D = (2\rho z^2 + \sin^2\phi) a_\rho + (\rho z^2 \sin 2\phi) a_\phi + (\rho^2 z \sin^2\phi) a_z$.	07
	OR	
Q.3	(a) State and explain physical meaning of divergence and its applications.	07
	(b) Given $D = 10 \sin\theta a_r + 2 \cos\theta a_\theta \text{ C/m}^2$. Prove that the charge density $\rho_v = (\sin\theta / r) [18 + 2\cot^2\theta] \text{ C/m}^3$	07
Q.4	(a) Derive the Maxwell's four equations in integral form.	07
	(b) Explain the magnetic boundary conditions in brief.	07
	OR	
Q.4	(a) State and explain the Ampere's circuital Law in detail.	07
	(b) State and explain Lorentz force equation.	07
Q.5	(a) Write short note on propagation constant.	07
	(b) Explain electromagnetic waves in perfect dielectric.	07
	OR	
Q.5	(a) Write short note on magnetization and permeability.	07
	(b) Write short note on wave propagation in good conductor.	07
