

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2022****Subject Code:3141009****Date:04-07-2022****Subject Name:Electromagnetic Theory****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) 'The divergence of curl of vector magnetic potential is zero'-Justify the statement.	03
	(b) Find the rectangular coordinates of the point A ($\rho = 4.4$, $\phi = -115^\circ$, $z=2$).	04
	(c) What is divergence? Explain the physical significance of divergence with two examples.	07
Q.2	(a) Find the $\mathbf{a}_x \cdot \mathbf{a}_\phi$ and $\mathbf{a}_z \cdot \mathbf{a}_\theta$	03
	(b) What is electric field intensity? Derive mathematical equation of electric field intensity due to a continuous volume charge distribution.	04
	(c) A uniform line charge density of 5 nC/m is at $y = 0$, $z = 2 \text{ m}$ in free space, while -5 nC/m is located at $y = 0$, $z = -2 \text{ m}$. A uniform surface charge density of 0.3 nC/m^2 is at $y = 0.2 \text{ m}$ and -0.3 nC/m^2 is at $y = -0.2 \text{ m}$. Find E at the origin.	07
	OR	
	(c) Given the flux density $\mathbf{D} = (\cos\theta/r^3) \mathbf{a}_r + (5\sin\theta/r^3) \mathbf{a}_\theta \text{ C/m}^2$, evaluate both sides of the divergence theorem for the region defined by $1 < r < 2$, $0 < \theta < \pi/2$, $0 < \phi < \pi$	07
Q.3	(a) What is the use of coordinate system? Explain the Cartesian coordinate system in brief.	03
	(b) State and explain Gauss's Law.	04
	(c) Write Maxwell's equations in integral form and explain physical significance of equations.	07
	OR	
Q.3	(a) State and explain Ampere's circuital Law in brief.	03
	(b) Derived the desired distance field for the dipole.	04
	(c) Write Maxwell's equations in point form and explain their physical significance.	07
Q.4	(a) Explain Skin effect.	03
	(b) Explain the reflection of uniform plane wave at normal incidence.	04
	(c) Current filaments of 2 A lies along x axis. Find H components at $B(-1, 3, 2)$.	07
	OR	
Q.4	(a) Compare spherical and Cylindrical coordinate systems.	03
	(b) State and explain Stoke's theorem.	04
	(c) For magnetic vector potential $\mathbf{A} = -r^2/2 \mathbf{a}_z \text{ Wb/m}$ calculate the total flux crossing the surface $\phi = \pi/2$, $2 \leq r \leq 4 \text{ m}$, $0 \leq z \leq 4 \text{ m}$.	07

- Q.5** (a) What is smith chart? What are its uses? **03**
(b) Explain one of the impedance matching methods of transmission line. **04**
(c) Write short note on plane wave reflection at oblique incidences angles. **07**
- OR**
- Q.5** (a) Define and explain voltage standing wave ratio. **03**
(b) Define and explain hall effect. **04**
(c) What are the applications of transmission line? Write the equations of transmission lines and their solutions in phasor form. **07**
