Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2024

Subject Code:3140912   **Date:18-07-2024**
Subject Name: Electromagnetic Fields
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)**	Describe how cylindrical coordinates are related to Cartesian coordinates in three-dimensional space.	**03**
	(b)	Explain the concept of an electrical dipole and its significance. omagnetic fields.	**04**
	(c)	1. Determine the rectangular coordinates of the given point $(4, -115^0, 2)$. 2. Convert the given point $(-3.1, 2.6, -3)$ from Cartesian to cylindrical coordinates. 3. Calculate the distance between points C and D in three-dimensional space.	**07**
Q.2	**(a)**	Define Coulomb's law.	**03**
	(b)	State and prove the Gauss's law. Also write limitations of Gauss's law.	**04**
	(c)	Two parallel conducting disks are separated by a distance 5 mm at z=0 and z=5 mm. if V=0 at z=0 and V=100 at z=5 mm. find charge densities on the disks.	**07**

OR

	(c)	The one dimensional Laplace's equation is given as $\frac{\partial^2 V}{\partial x^2} = 0$. The boundary conditions are V=9 at x=1 and V=0 at x=10. Find the potential and also show the variation of V with respect to x.	**07**
Q.3	**(a)**	Explain phenomenon of polarization.	**03**
	(b)	Explore the characteristics of dielectric materials and provide a definition for Dielectric strength.	**04**
	(c)	Describe and derive the boundary condition applicable to interfaces between dielectric materials.	**07**

OR

Q.3	**(a)**	Explain concept of electric potential difference	**03**
	(b)	Write Poisson's and Laplace equation. Also state use of this equation.	**04**
	(c)	Define potential difference and potential gradient. Also Establish relation between Electrical field and potential gradient.	**07**
Q.4	**(a)**	State and explain Ampere circuital law.	**03**
	(b)	Distinguish between steady magnetic field and time varying magnetic field.	**04**
	(c)	Explain Stoke's theorem with its mathematics expression.	**07**

OR

Q.4	**(a)**	State and explain Biot Savart's law	**03**
	(b)	Define the physical significance of the term: Curl of a vector.	**04**
	(c)	Evaluate the expression curl H=J.	**07**
Q.5	**(a)**	What is inductance? Explain self inductance and mutual inductances.	**03**

(b)	What are the applications of Lorentz Force Equation?	**04**
(c)	State and Explain Lorentz force equation on charged particles.	**07**

OR

Q.5	**(a)**	What is the Significance of displacement current?	**03**
	(b)	Define displacement current and current density.	**04**
	(c)	Analyze Maxwell's equations for Static fields. Explain how they are modified for time varying electric and magnetic fields. Derive the time varying Maxwell's equation for curl of H and also mention its physical significance.	**07**

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