Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2022

Subject Code:3140912 Date:27-06-2022

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)**	Define unit vectors of Cartesian, cylindrical and spherical coordinate systems.	**03**
	(b)	State and Explain various types of charge distribution with mathematical equation.	**04**
	(c)	Explain Cylindrical co-ordinate system along with the equations of differential length, differential surfaces and differential volume elements.	**07**
Q.2	**(a)**	Explain electric dipole. Derive the expression for E at any distinct point from dipole.	**03**
	(b)	Express Maxwell's first equation as applied to electrostatics, using Gauss's law.	**04**
	(c)	Point charges 1 mC and - 2 mC are located at (3, 2,-1) and (-1, -1,4), respectively. Calculate the electric force on a 10 nC charge located at (0, 3, 1) and The electric field intensity at (0, 3, 1).	**07**
		OR	
	(c)	Analyze the expression for potential difference due to infinite line charge.	**07**
Q.3	**(a)**	Develop examples of different capacitor configuration.	**03**
	(b)	Explain physical meaning of Divergence.	**04**
	(c)	Determine boundary condition between two perfect Dielectrics.	**07**
		OR	
Q.3	**(a)**	State uniqueness theorem.	**03**
	(b)	Write Poisson's and Laplace equation. Also state use of this equation.	**04**
	(c)	At a potential $V= 2xy^2z^3$ and $\varepsilon=\varepsilon 0$. Given point P(1,3,-1). Find V at point P. Also Solve if V satisfies Laplace equation.	**07**

Q.4	**(a)**	State and explain Ampere circuital law.	**03**
	(b)	Distinguish between steady magnetic field and time varying magnetic field.	**04**
	(c)	Find the vector magnetic field intensity in cartesian coordinates at P2 (1.5, 2, 3) caused by a current filament of 24 A in az direction on the z axis and extending from z=0 to z=6.	**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)	A circular loop located on $x^2 + y^2 = 9$, Z=0 carries a direct current of 10 A along $\bar{a\phi}$. Determine $\bar{H}$ at (0,0,4) and (0,0,-4).	**07**

Q.5	**(a)**	Classify magnetic materials.	**03**
	(b)	Explain force between two differential current elements.	**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)	How electromagnetic fields are represented in phasor form?	**04**
	(c)	State and Explain Maxwell's equation in point form and integral form for static electromagnetic field.	**07**

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