GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2021

Subject Code:3140912   **Date:01/01/2022**
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)**	State and explain Coulomb's law.	03
	(b)	State and explain Gauss's law.	04
	(c)	Explain and draw the figure for the orthogonal system which has its spherical coordinate is angle made be cone and z-axis. Transform the spherical coordinate system to Cartesian coordinate system.	07
Q.2	**(a)**	State and Explain various types of charge distribution with mathematical equation.	03
	(b)	Derive relation between current density and Volume charge Density.	04
	(c)	Obtain the spherical co-ordinates of $10\,\overline{a}_x$ at the point P(x= -3,y=2,z=4).	07
		OR	
	(c)	An infinite uniform linear charge ρ_L=2 nC/m line along the x axis in free space, while charge of 8 nC is located at (0,0,1) find E at (2,3, - 4).	07
Q.3	**(a)**	Explain boundary conditions between two perfect dielectric materials.	03
	(b)	Explain phenomenon of polarization	04
	(c)	Evaluate both sides of the divergence theorem for the filed $\overline{D} = 2xy\overline{a}_x + x^2\overline{a}_y$ C/m^2 and the rectangular parallelopiped formed by the planes x=0 and 1, y=0and 2, z=0and3.	07
		OR	
Q.3	**(a)**	Define conservative field	03
	(b)	Explain Electrical field as the Gradient of the electrical potential	04
	(c)	Obtain the expression for field intensity H at the centre of a circular carrying current I, using Bio-Savart Law.	07
Q.4	**(a)**	Explain Characteristics impedance and propagation constant of the transmission line.	03
	(b)	State Maxwell's equation in point form and integral form for static electromagnetic field.	04
	(c)	A dielectric free space has equation 3x+2y+z=12 m, The origin side of the interface has εr1=3 and E1= $2\overline{a}_x + 5\overline{a}_z$ V/m. Find E$_2$.	07
		OR	
Q.4	**(a)**	Give examples of different capacitor configuration.	03
	(b)	Explain polarization with reference to dielectrics	04
	(c)	Obtain the Expression for field intensity H at the center of a circular carrying current I, using Biot-Savart law.	07
Q.5	**(a)**	Write Effect of Electromagnetic Interference.	03

(b)	Explain magnetic dipole moment.		**04**
(c)	Define potential difference and potential gradient. Also Establish relation between Electrical field and potential gradient.		**07**

<div align="center">OR</div>

Q.5	**(a)**	Write Poisson's and Laplace equation. also state use of this equation and uniqueness theorem	**03**
	(b)	State and explain source of EMI.	**04**
	(c)	Derive transmission line equation with help of equivalent circuit.	**07**

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