Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER–III • EXAMINATION – SUMMER • 2014

Subject Code: X31102   **Date: 20-06-2014**
Subject Name: Engineering Electromagnetics
Time: 02:30 pm – 05:00 pm   **Total Marks: 70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define the terms: scalar, vector & unit vector. Also explain spherical coordinate system with neat & clean diagram in brief.	**07**
	(b)	Given $A = 6a_x + 2a_y + 5a_z$ & $B = 2a_x + 4a_y + 7a_z$ Find The angle between A & B, The distance between their tips , Unit vector normal to the plane containing A & B and the area of the parallelogram of which A & B are adjacent sides.	**07**
Q.2	**(a)**	Define the electric field intensity. Also derive the expression for the electric field intensity due to a line charge of uniform density of ρ_l C/m lying on the z axis.	**07**
	(b)	Convert the given vector $A = 3a_x + 4a_y + 5a_z$ to spherical coordinate system.	**07**
		OR	
	(b)	For given surface charge density $\rho_s = x^2 + xy$, calculate $\int \rho_s \, dS$ over the region specified by $y \le x^2$ & $0 < x < 1$.	**07**
Q.3	**(a)**	Discuss the Farady's experimental setup for the electrostatic field. Also state & prove Gauss's law.	**07**
	(b)	Define the term volume charge density. Obtain the expression for the volume charge density for given $D = (4xy/z)a_x + (2x^2y/z^2)a_y - (2x^2y/z^2)a_z$	**07**
		OR	
Q.3	**(a)**	State & explain the divergence theorem.	**07**
	(b)	Evaluate both side of the divergence theorem for the field $D = 2 \, xy \, a_x + x^2 \, a_y$ C/m^2 and the rectangular parallelepiped formed by the plane $0 < x < 1$, $0 < y < 2$, $0 < z < 3$.	**07**
Q.4	**(a)**	Derive the expression for the electric field intensity E due to a dipole at distant point.	**07**
	(b)	For given potential field $V = 2x^2y - 5z$, and a point $P(-4,3,6)$,find the electric field density D and volume charge density ρ_v.	**07**
		OR	
Q.4	**(a)**	State Bio Savart law & derive the expression for the magnetic field intensity if infinitely long wire carrying current I located on the z axis.	**07**
	(b)	Explain in brief Uniqueness theorem.	**07**
Q.5	**(a)**	State & prove Poynting's theorem relating to the flow of energy at a point in space in and electromagnetic field.	**07**
	(b)	Write a brief note on wave propagation in a good conductor.	**07**
		OR	
Q.5	**(a)**	State Maxwell's equations in point form and explain physical significance of the equations.	**07**
	(b)	Write a short note on Stoke's theorem.	**07**

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