Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–III • EXAMINATION – SUMMER 2013

Subject Code: X31102 **Date: 13-05-2013**

Subject Name: Engg. 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)**	With neat & clean sketches explain Cylindrical Coordinate system. Give the table for the dot product of unit vectors in Cylindrical & Rectangular Coordinate systems with due justification.	**07**
	(b)	Express $\mathbf{a_\rho}$ in spherical coordinate system.	**07**
Q.2	**(a)**	Define electric field intensity & derive the electric field intensity for a line charge located on z axis in free space.	**07**
	(b)	An infinitely long, uniform line charge is located at y=3, z=5. If ρ_L=30 nC/m, find electric field intensity **E** at point P(5,6,1).	**07**
		OR	
	(b)	Find the equation of that streamline that passes through the point P(-2,7,10) in the field $\mathbf{E}=2(y-1)\,\mathbf{a_x} + 2x\,\mathbf{a_y}$.	**07**
Q.3	**(a)**	Explain energy density in the electrostatic field.	**07**
	(b)	If potential $V = (60 \sin \theta)/r^2$ in free space, obtain the volume charge density ρ_v at point P(r=3 m, θ=60˚, Ø=25˚).	**07**
		OR	
Q.3	**(a)**	Write a detail note on potential gradient.	**07**
	(b)	Semi infinite conducting planes at Ø=0 & Ø=π/6 are separated by an insulating gap. If V=0 at Ø=0 & V=100 at Ø=π/6, calculate V & **E** in the region between the planes.	**07**
Q.4	**(a)**	Derive the expression for the electric field intensity at a distant point in free space for the dipole & define the term dipole moment.	**07**
	(b)	For given potential field: $V=2x^2y-5z$, Determine volume charge density ρ_v at point P (-4,3,6).	**07**
		OR	
Q.4	**(a)**	Explain Uniqueness theorem in brief.	**07**
	(b)	For given $\mathbf{G}=\sin\theta(a_r + a_\theta + a_Ø)$, determine curl of at point P(4,30˚,45˚).	**07**
Q.5	**(a)**	Describe Lorentz force equation & derive the expression for force exerted between differential current elements.	**07**
	(b)	Describe the Faraday's law for time varying magnetic field, and explain retarded potentials.	**07**
		OR	
Q.5	**(a)**	State Maxwell's equations in point form & integral form, also explain its physical significance.	**07**
	(b)	Write a detail note on Poynting's theorem.	**07**

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