Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – SUMMER 2013

Subject Code: 160906 **Date: 04-06-2013**

Subject Name: Theory of Electromagnetics

Time: 10.30 am - 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.**

Q.1	**(a)**	Explain cylindrical coordinate system, differential elements and transformation method from cylindrical to cartesian coordinate system.	**07**
	(b)	Transform the vector $4\boldsymbol{a}_x - 2\boldsymbol{a}_y - 4\boldsymbol{a}_z$ into spherical coordinates at a point P $(x=-2, y=-3, z=4)$.	**07**
Q.2	**(a)**	Derive the expression for total electric field intensity due to infinite surface charge distribution in free space.	**07**
	(b)	Let $\boldsymbol{D}=2y^2z^2\,\boldsymbol{a}_x + 3xy^2z^2\,\boldsymbol{a}_y + 2xyz\,\boldsymbol{a}_z$ pC/m^2 in free space. Find (a) the total electrical flux passing through the surface x=2, 0Òy Ò2, and 0Òz Ò2 in a direction away from the origin, (b) the total charge contained in an incremental sphere of a radius 1 µm centered at $P(2,2,2)$.	**07**
		OR	
	(b)	Define divergence and its physical significance.	**07**
Q.3	**(a)**	Explain potential and potential gradient. Derive relationship between potential and electric field intensity.	**07**
	(b)	A non uniform field E = y $\mathbf{a}_x$+ x $\mathbf{a}_y$ + 2$\mathbf{a}_z$. Determine the work expended in carrying 2C from B(1,0,1) to A(0.8,0.6,1) along the shorter arc of the circle $x^2+y^2=1$, z=1. Find the work required to carry same charge from B to A through straight line joining B to A in the same field.	**07**
		OR	
Q.3	**(a)**	Explain the Gaussôs law applied to infinite line charge and derive the expression for **D** due to infinite line charge.	**07**
	(b)	Derive Poissonôs and Laplaceôs equations from fundamental.	**07**
Q.4	**(a)**	Write a short note on Displacement Current.	**07**
	(b)	Write and explain differential and integral forms of Maxwellôs equations.	**07**
		OR	
Q.4	**(a)**	Derive the relation between I and J and explain the continuity equation of steady electric current in integral form and point form.	**07**
Q.4	**(b)**	Explain and derive the boundary conditions for a dielectric- dielectric interface.	**07**
Q.5	**(a)**	State and explain Ampereôs circuital law.	**07**
	(b)	What is inductance? Explain self inductance and mutual inductance.	**07**
		OR	
Q.5	**(a)**	State and prove uniqueness theorem.	**07**
	(b)	Explain force on a differential current element.	**07**