Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – WINTER 2013

Subject Code: 160906 **Date: 09-12-2013**

Subject Name: Theory of Electromagnetics

Time: 02:30 pm to 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)**	Transform the following vectors to spherical coordinates at the points given: (a) $10a_x$ at P (x = -3, y =2, z = 4); (b) $10a_y$ at Q (ρ = 5, Ø = 30^0, z =4); (c) $10a_z$ at R(r =4, ɵ = 110^0, Ø = 120^0).	**07**
	(b)	Define Electric field intensity. Derive the necessary equation for electric filed Intensity due to line charge.	**07**
Q.2	**(a)**	State Gauss's Law. Find divergence D at the origin if D = $e^{-x}\sin yax - e^{-x}\cos yay + 2za_z$	**07**
	(b)	Derive necessary equation for potential gradient from the electric filed intensity by means of a line integral.	**07**
		OR	
	(b)	Explain boundary conditions for perfect dielectric materials.	**07**
Q.3	**(a)**	A 15-nC point charge is at the origin in free space. Calculate V_1 if point P_1 is located at P_1(-2,3,-1) and (a) V=0 at (6,5,4); (b) V=0 at infinity; (c) V = 5V at (2,0,4).	**07**
	(b)	Derive Poisson's and Laplace's equation.	**07**
		OR	
Q.3	**(a)**	Explain Ampere's circuital law.	**07**
	(b)	Write a short note on "Magnetic Resonance Imaging."	**07**
Q.4	**(a)**	Explain Biot-Savart's law.	**07**
	(b)	State Lorentz force equation. Give the classification of magnetic materials.	**07**
		OR	
Q.4	**(a)**	Explain the construction and working principle of Magneto Hydrodynamic (MHD) Generator.	**07**
	(b)	Explain and derive Maxwell's equations in Point and Integral form.	**07**
Q.5	**(a)**	Explain advantages and applications of numerical techniques.	**07**
	(b)	An electric dipole located at the origin in free space has a moment p = $3a_x$-$2a_y$+a_z nC.m (a) find V at P_A (2,3,4).	**07**
		OR	
Q.5	**(a)**	Write a short note on " Finite element Method"	**07**
	(b)	A charge of -0.3 μC is located at A(25,-30,15) (in cm), and a second charge of 0.5 μC is at B(-10,8,12) cm. Find Electric field intensity E at (a) the origin; (b) P(15,20,50) cm.	**07**

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