Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 160906 **Date: 03/05/2017**

Subject Name: Theory of Electromagnetics

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.**

Q.1	**(a)**	Draw the figure for the orthogonal system which has its second coordinate is angle made by cone and z- axis. Transform the co-ordinates of this system in to Cartesian co-ordinate	**07**
	(b)	Given points A(x = 2, y = 3, z = -1) and B(ρ = 4, ϕ = -50˚, z = 2), find a unit vector in cylindrical co-ordinates: (a) at point B directed toward point A (b) at point A directed toward point B.	**07**
Q.2	**(a)**	State coulomb's law of electric for various type of charge distribution.	**07**
	(b)	Derive and explain continuity equation for steady current.	**07**
		OR	
	(b)	Find the stored energy in a system of four identical charges Q= 2 nC, at the corners 1 m on a side.	**07**
Q.3	**(a)**	State and explain Biot-savart's law for static magnetic fields as applied to different types of current distribution.	**07**
	(b)	Calculate electric field E at a point N (3,-4, 2) in free space caused by (a) a charge $Q_1 = 2$ µC at P_1 (0,0,0) (b) A charge $Q_2 = 3$ µC at P_2 (-1,2,3) (c) Both the charges of part (a) & (b) present.	**07**
		OR	
Q.3	**(a)**	State and explain ampere's circuit law both in integral differential form as used in magnetic field	**07**
	(b)	Given the field H = 6r sin ϕ $\overline{a_r}$ + 18r sin θ cos ϕ $\overline{a_\phi}$, evaluate both side of Stroke's theorem for the portion of the cone θ = 0.1 π Bounded by r = 2 , r = 4, ϕ = 0 and ϕ = 0.3 π. Let the direction of $\overline{dS}$ be + $\overline{a_\theta}$ θ	**07**
Q.4	**(a)**	Express for electric field intensity at any point to a line charge with uniform charge density ρ_l C/m on the infinitely long Z-axis	**07**
	(b)	Four infinite uniform sheets of charge are located as follows: 20pC/m^2 at y = 7,-8 pC/ m^2 at y=3 , 6 pC/m^2 at y=-1, and -18 pC/m^2 at y = - 4 . Find $\bar{E}$ at the point : P_A (2,6,-4) ; (b) P_B (0,0,0) (c) P_C (-1,-1,1.5) ; (d) P_D (10^6 , 10^6, 10^6)	**07**
		OR	
Q.4	**(a)**	State and Explain Lorentz force equation on charge particle and explain the concept of magnetic torque	**07**
	(b)	Derive Poisson's and Laplace's equation.	**07**
Q.5	**(a)**	Explain concept of potential gradient and prove that **E** = - ∇ **V**	**07**
	(b)	Write Maxwell equation in point form and in integral form	**07**
		OR	
Q.5	**(a)**	States explain gauss's law. Obtain electric field intensity of line charge using gauss's law	**07**
	(b)	Explain applications of numerical techniques in engineering	**07**

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