Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (New) EXAMINATION – WINTER 2015

Subject Code:2140909 **Date:01/01/2016**

Subject Name: Field Theory

Time: 2:30pm to 5:00pm **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 Cartesian co-ordinate system along with the equations of differential length, differential surfaces and differential volume elements.	**07**
	(b)	The given points are $A\ (x = 2, y = 3, z = -1)$ and B $(r = 4, \theta = 25^o, \phi = 120^o)$. Find (i) Spherical co-ordinates of A (ii) Cartesian co-ordinates of B and (iii) Distance from A to B.	**07**
Q.2	**(a)**	An infinite uniform line charge having line charge density of $\rho_L = 200\ nC/m$ placed on the z-axis. Find the total electric field intensity at $(6, 8, 3)\ m$.	**07**
	(b)	Derive the expression of $\bar{E}$ (Electric field intensity) at any point P due to infinite uniform line charge distribution in free space.	**07**
		OR	
	(b)	A circular ring with radius of $5\ m$ lies on $z = 0$ plane with its centre at origin. If $\rho_L = 10\ nC/m$, find value of a point charge Q placed at origin which will produce the same value of $\bar{E}$ (Electric field intensity) at point $(0, 0, 5)\ m$.	**07**
Q.3	**(a)**	Define divergence and its physical significance.	**07**
	(b)	Derive expression of electric field intensity due to an electric dipole.	**07**
		OR	
Q.3	**(a)**	Derive Maxwell's first equation applied to electrostatic using Gauss's law.	**07**
	(b)	Derive relationship between potential and electric field intensity.	**07**
Q.4	**(a)**	State and explain Ampere's circuital law.	**07**
	(b)	Explain boundary conditions between two perfect dielectric materials.	**07**
		OR	
Q.4	**(a)**	State Maxwell's equations in integral form and explain physical significance of the equations.	**07**
	(b)	Derive the relation between I and J.	**07**
Q.5	**(a)**	Derive Poisson's and Laplace's equations.	**07**
	(b)	Derive Lorentz Force Equation.	**07**
		OR	
Q.5	**(a)**	Write a short note on EMI & EMC.	**07**
	(b)	Describe the physical description of transmission line propagation.	**07**

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