Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2015

Subject Code: 2140909 **Date: 08/06/2015**

Subject Name: FIELD THEORY

Time: 10:30am-1.00pm **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 cylindrical coordinate system in brief. Also write the equations of differential length, differential surfaces and differential volume elements.	**07**
	(b)	The given points are $A(x=-1,\ y=2,\ z=3)$, $B(\rho=3,\ \Phi=60°,\ z=6)$ and $C(x=2,\ y=3,\ z=-1)$. Find (i) Cylindrical co-ordinates of A (ii) Cartesian co-ordinates of B and (iii) Spherical co-ordinates of C.	**07**
Q.2	**(a)**	An infinite uniform line charge having line charge density of $\rho_L = 30\ \mu C/m$ placed on the z-axis. Find the total electric field intensity at $(3,\ 4,\ 5)\ m$.	**07**
	(b)	Derive the equation of total electric field intensity in vector form due to infinite uniform sheet charge distribution in free space.	**07**
		OR	
	(b)	A positively charged circular ring with $\rho_L = 10\ nC/m$ having radius of $5\ m$ lies on $z=0$ plane with its centre at origin. Find $\bar{E}$ at point $(0,\ 0,\ 5)\ m$ and also find the value of a point charge Q which will produce the same $\bar{E}$ at a point $(0,\ 0,\ 5)\ m$.	**07**
Q.3	**(a)**	State and explain the Gauss's law.	**07**
	(b)	Derive the Maxwell's first equation applied to Electrostatic by using equations of divergence and Gauss's law for electric flux density $\bar{D}$.	**07**
		OR	
Q.3	**(a)**	Define the potential gradient. Derive relationship between potential and electric field intensity.	**07**
	(b)	Derive equation of potential difference V_{AB} within the electric field produced by a point charge Q.	**07**
Q.4	**(a)**	Write a short note on continuity equation.	**07**
	(b)	Explain boundary conditions between two perfect Dielectric materials.	**07**
		OR	
Q.4	**(a)**	Derive Poisson's and Laplace's equations.	**07**
	(b)	State Maxwell's equations in point form and explain physical significance of the equations.	**07**
Q.5	**(a)**	State and Explain Ampere circuital law.	**07**
	(b)	A point charge, Q = −10 μC, is moving with a velocity of 6×10^6 m/s in a direction specified by the unit vector $\bar{a}_v = 0.5\bar{a}_x - 0.6\bar{a}_y + 0.2\bar{a}_z$. Find the magnitude of the vector force exerted on that moving charge by the field: (a) $\bar{B} = 2\bar{a}_x - 3\bar{a}_y + 5\bar{a}_z$ T; (b) $\bar{E} = 2\ \bar{a}_x - 3\ \bar{a}_y + 5\bar{a}_z$ kV/m; (c) $\bar{B}$ and $\bar{E}$ acting together.	**07**
		OR	
Q.5	**(a)**	Explain loss less propagation of sinusoidal voltage in transmission line.	**07**
	(b)	Write a short note on sources of EMI.	**07**

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