Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–III • EXAMINATION – WINTER • 2014

Subject Code:X31102 **Date: 29-12-2014**

Subject Name: Engineering Electromagnetics

Time: 10:30 am - 01:30 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)**	With neat & clean sketches explain Cylindrical Coordinate system. Give the dot table for the dot product of unit vectors in Cylindrical & Cartesian Coordinate systems with due justification.	**07**
	(b)	Answer the followings.	
		i) Define the term dot product; enlist the applications of the same.	**03**
		ii) Express the given vector **A**= r $\mathbf{a_r}$ in Cartesian coordinates at point P(5,90˚,0˚)	**04**
Q.2	**(a)**	Define the term line charge. Also derive the expression for the electric field intensity due to a line charge ρ_L c/m located on the z axis at point P (0,y,0).	**07**
	(b)	Four identical 3 nC point charges located at P(1,1,0), Q(-1, 1, 0), R(-1,-1,0) and S(1,-1,0) , determine the electric filed intensity at point D(1,1,1) due to these identical point charges.	**07**
		OR	
	(b)	Infinite uniform line charges of 5 nC /m lie along the (positive and negative) x and y axes in free space. Find the electric field intensity at point P(0,3,4).	**07**
Q.3	**(a)**	State Faraday's law. Also prove the point form of Gauss's law.	**07**
	(b)	Determine the expression of volume charge density associated for the given **D** = z sin Ø $\mathbf{a_\rho}$ + z cos Ø $\mathbf{a_Ø}$ + ρ sin Ø $\mathbf{a_z}$.	**07**
		OR	
Q.3	**(a)**	State and explain the divergence theorem.	**07**
	(b)	Evaluate both side of the divergence theorem for the field **D** = 2 xy $\mathbf{a_x}$ + x^2 $\mathbf{a_y}$ C/m^2 and the rectangular parallelepiped formed by the planes x = 0 and 1, y = 0 and 2, and z = 0 and 3.	**07**
Q.4	**(a)**	Write a brief note on potential gradient.	**07**
	(b)	The point charges -1 nC, 4 nC and 3 nC are located at A(0,0,0), B(0,0,1) and C(1,0,0) respectively, find the energy in the system.	**07**
		OR	
Q.4	**(a)**	Derive the expression for the electric field intensity at a distant point in free space for the dipole & define the term dipole moment.	**07**
	(b)	Calculate numeric values for V and ρ_v at point P(0.5, 45˚, 60˚) for V=2 r^{-2}cos Ø.	**07**
Q.5	**(a)**	Write a detail note on magnetic boundary condition.	**07**
	(b)	Define the curl of a vector quantity. Evaluate the Curl of given vector field **A** = r^{-2} cos θ $\mathbf{a_r}$ + r sin θ cos Ø $\mathbf{a_\theta}$ + cos θ $\mathbf{a_Ø}$.	**07**
		OR	
Q.5	**(a)**	Explain in brief wave propagation in free space.	**07**
	(b)	State and prove Poynting's theorem relating to the flow of energy at a point in space in an electromagnetic field.	**07**

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