Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–III • EXAMINATION – SUMMER 2013

Subject Code: X31102 **Date: 13-05-2013**

Subject Name: Engg. Electromagnetics

Time: 02.30 pm - 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)** With neat & clean sketches explain Cylindrical Coordinate system. Give the table for the dot product of unit vectors in Cylindrical & Rectangular Coordinate systems with due justification. **07**

(b) Express $\mathbf{a_\rho}$ in spherical coordinate system. **07**

Q.2 **(a)** Define electric field intensity & derive the electric field intensity for a line charge located on z axis in free space. **07**

(b) An infinitely long, uniform line charge is located at y=3, z=5. If ρ_L=30 nC/m, find electric field intensity **E** at point P(5,6,1). **07**

OR

(b) Find the equation of that streamline that passes through the point P(-2,7,10) in the field $\mathbf{E}=2(y-1)\,\mathbf{a_x} + 2x\,\mathbf{a_y}$. **07**

Q.3 **(a)** Explain energy density in the electrostatic field. **07**

(b) If potential $V = (60 \sin\theta)/r^2$ in free space, obtain the volume charge density ρ_v at point P(r=3 m, θ=60˚, Ø=25˚). **07**

OR

Q.3 **(a)** Write a detail note on potential gradient. **07**

(b) Semi infinite conducting planes at Ø=0 & Ø=π/6 are separated by an insulating gap. If V=0 at Ø=0 & V=100 at Ø=π/6, calculate V & **E** in the region between the planes. **07**

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) For given potential field: $V=2x^2y–5z$, Determine volume charge density ρ_v at point P (-4,3,6). **07**

OR

Q.4 **(a)** Explain Uniqueness theorem in brief. **07**

(b) For given $\mathbf{G}=\sin\theta(a_r + a_\theta + a_\emptyset)$, determine curl of at point P(4,30˚,45˚). **07**

Q.5 **(a)** Describe Lorentz force equation & derive the expression for force exerted between differential current elements. **07**

(b) Describe the Faraday's law for time varying magnetic field, and explain retarded potentials. **07**

OR

Q.5 **(a)** State Maxwell's equations in point form & integral form, also explain its physical significance. **07**

(b) Write a detail note on Poynting's theorem. **07**

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