Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER – III • EXAMINATION – WINTER 2012

Subject code: X31102 **Date: 28/12/2012**

Subject Name: Engineering Electromagnetics

Time: 10.30 am - 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)**	Define the dot product & cross product for vector **A** & **B**. Also give the applications of the cross product.	**07**
	(b)	Given point P(-2,6,3) & $\mathbf{A} = y\mathbf{a_x} + (x + y)\,\mathbf{a_y}$. Express point P in cylindrical & spherical coordinate system. And find vector **A** in spherical coordinate system at point P.	**07**
Q.2	**(a)**	Explain the faraday's law. Also state & prove the gauss's law.	**07**
	(b)	Point charges 1 mC & -2 mC are located at P(3,2,-1) & Q(-1,-1,4) respectively. Calculate the electric force exerted on a 10 nC charge located at R(0,3,1) and the electric field intensity at that point.	**07**
		OR	
	(b)	The finite sheet $0 \le x, y \le 1$ & $z = 0$ plane has a charge $\rho_s = xy\,(x^2 + y^2 + 25)^{3/2}$ nC/m^2, find total charge on the sheet & electric field at point P(0,0,5).	**07**
Q.3	**(a)**	Explain vector operator. And also state & prove the divergence theorem.	**07**
	(b)	Find the value of integral of **D·dS** over a closed surface of sphere r = 1.	**07**
		OR	
Q.3	**(a)**	Derive the Poisson's equations & Laplace's equations. Also explain uniqueness theorem.	**07**
	(b)	Define electric flux density & for given the potential $V = (10 \sin\theta \cos\varnothing) / r^2$, find the electric flux density **D** at P (2, 90˚,0).	**07**
Q.4	**(a)**	Define curl of a vector **A** & its significance**.** Also explain Stoke's theorem in brief.	**07**
	(b)	Semi infinite planes at $\varnothing = 0$ & $\varnothing = \pi/6$ are separated by an infinitesimal insulating gap. If V = 0 at $\varnothing = 0$ & V = 100 at $\varnothing = \pi/6$, calculate potential V & electric field intensity **E.**	**07**
		OR	
Q.4	**(a)**	Define Bio Savart law & derive the expression for force & torque on closed circuit.	**07**
	(b)	For ferrite material which is operating in the linear mode with B=0.005 T & $\mu_r = 50$. Determine the magnetic susceptibility, magnetization & magnetic field intensity.	**07**
Q.5	**(a)**	Explain the Faraday's law for time varying field. Also Describe the retarded potentials.	**07**
	(b)	State Maxwell's equations in point form & explain physical significance of the equations.	**07**
		OR	
Q.5	**(a)**	Define the term Magnetization. And explain magnetic boundary condition.	**07**
	(b)	State & prove Poynting theorem relating to the flow of energy at a point in space in an electromagnetic field.	**07**

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