Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–III EXAMINATION – SUMMER 2016

Subject Code:X31102 **Date:30/05/2016**

Subject Name:Engineering Electromagnetics

Time:02:30 PM to 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)**	Points A(r = 100, $\theta = 90^o$ $\phi = 0^o$) and B (r = 100, $\theta = 90^o$ $\phi = 5^o$) are located on the surface of a 100 meter radius sphere. (a) What is their separation using a path on the spherical surface? (b) What is their separation using a straight line path?	**07**
	(b)	State and prove the Divergence theorem.	**07**
Q.2	**(a)**	Derive the expression for the Electric field intensity E due to the infinite line charge placed on the z-axis.	**07**
	(b)	Derive the poisson's equation from point form of gauss's law. Derive the laplace's equation and write the laplace's equation in Cartesian, cylindrical and spherical coordinate system.	**07**
		OR	
	(b)	Write a Short Note: Maxwell's equation for electrostatic field.	**07**
Q.3	**(a)**	Explain the concept of potential gradient and derive the relationship between E and V	**07**
	(b)	Point charge of 15 nC each are symmetrically located at A (4, 4, 0), B (4, - 4, 0), C (- 4, 4, 0) and D (- 4, - 4, 0) and uniform line charge of 50 nC / m lies at x = 0 y = 8. (a) Find D at origin. (b) How much electric flux crosses the plane y = 0? (c) How much electric flux leaves the surface of a sphere of radius 5m centered at (0, 6, 0)?	**07**
		OR	
Q.3	**(a)**	Give the statement of biot-savart law and explain its application.	**07**
	(b)	Two uniform line charges, 8 nC / m each, are located at x =1, z =2 and at x = -1, y = 2 in free space. If the potential at origin is 100V, find V at P(4, 1, 3).	**07**
Q.4	**(a)**	Derive the electrostatic boundary condition for the Dielectric-Dielectric interface.	**07**
	(b)	Find | H | at p (2, 3, 5) in Cartesian coordinates if there is an infinitely long current filament passing through the origin and point C. The current of 50 A is directed from the origin to C, where the location of C is (a) (0, 0 ,1) (b) (0, 1, 0)	**07**
		OR	
Q.4	**(a)**	State and explain uniqueness theorem.	**07**
	(b)	Verify the stoke's theorem for the field $\bar{H} = 6xy\, a_x - 3y^2\, a_y$ and the rectangular path around the region $2 \le x \le 5$, $-1 \le y \le 1$, z = 0 let the positive direction of ds be a_z.	**07**
Q.5	**(a)**	What is poynting vector? Explain the physical interpretation and significance of it?	**07**
	(b)	A point charge $Q_A = 1\mu$ C is located at A (0, 0, 1) and $Q_B = -1\mu$ C is located at B (0, 0, -1). Find E_r, E_θ, E_ϕ at p (1, 2, 3).	**07**

OR

Q.5	**(a)**	Derive the wave equation for propagation of wave in the perfect dielectric media.	**07**
	(b)	Find the volume defined by $4 < \rho < 6$, $30^o < \phi < 60^o$, $2 < z < 5$. Also find what is the length of the longest straight line that lies entirely within the volume.	**07**

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