Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V- EXAMINATION – SUMMER 2016

Subject Code: 151002 **Date: 09/05/2016**

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)** With the help of neat sketches, briefly explain the cylindrical coordinate system. Also give the dot table relating to the vectors in cylindrical coordinate & rectangular coordinate systems & justify. **07**

(b) (i)The three vertices of a triangle are located at A(6,-1,2), B(-2,3,-4), and C(-3,1,5). Find (a) R_{AB} (b) R_{AC} (c) The angle θ_{BAC} at vertex A. **07**
(ii)Transform vector field **G** = (xz/y) $\mathbf{a_x}$ into spherical components and variables.

Q.2 **(a)** Define electric field intensity. Derive the expression for the intensity of electric field due a line charge along the Z direction with uniform charge density ρ_L c/m using Coulomb's law and verify the same using Gauss's law. **07**

(b) Derive an equation of energy stored in capacitor and also find out capacitance of an isolated sphere. **07**

OR

(b) Derive the expression for the electric field E due to infinite sheet of charge having a uniform density of ρ_s C/m^2. **07**

Q.3 **(a)** What do you mean by dipole? Derive the approximate expression for Potential V and Electric field intensity E at a point in the free space. **07**

(b) Given the potential field, V = $2x^2y$ – 5z, and a point P(-4,3,6). Find the following numerical values at point P. **07**
(i) The potential V (ii) the electric field intensity **E** (iii) the electric flux density **D** (iv) the volume charge density ρ_v

OR

Q.3 **(a)** A nonuniform field E is given **E** = y$\mathbf{a_x}$ + x$\mathbf{a_y}$+ 2$\mathbf{a_z}$. Determine the work expanded in carrying 2C from B (1,0,1) to A (0.8,0.6,1) **07**

(i) Along the shorter arc of the circle $x^2 + y^2 = 1$, z=1.

(ii) Along the straight line path from B to A.

(b) Write short note on magnetic boundary conditions. **07**

Q.4 **(a)** The point charge Q = 18 nC has a velocity of 5X 10^6 m/s in the direction a_v = 0.60 a_x + 0.75 a_y + 0.30 a_z. Calculate the magnitude of the force exerted on the charge by the field (i) **B** = -3 $\mathbf{a_x}$ + 4$\mathbf{a_y}$ + 6 $\mathbf{a_z}$ mT (ii) **E** = -3 $\mathbf{a_x}$ + 4$\mathbf{a_y}$ + 6 $\mathbf{a_z}$ kV/m (iii) **B** and **E** acting together **07**

(b) Write down a statement of Biot-Savart's law and explain in detail **07**

OR

Q.4 **(a)** State ampere's circuital law & derive the expression for curl of magnetic field intensity. **07**

(b) State Stoke's theorem. Evaluate both side of stokes theorem for the field **H** = (6 r sinØ) $\mathbf{a_r}$ + (18 r sinθ cosØ) $\mathbf{a_Ø}$ **,** surface specified by r = 4, $0 \le \theta \le 0.1\,\pi$, $0 \le Ø \le 0.3\,\pi$. **07**

Q.5 **(a)** What do you mean by perfect dielectric? Explain plane wave propagation in perfect dielectric and derive expression for velocity of propagation, intrinsic **07**

impedance, attenuation constant and phase constant for the same.

	(b)	Write down a general procedure for solving poisson's or laplace's equation & also explain a Uniqueness theorem.	**07**

OR

Q.5	**(a)**	Mention all four Maxwell's equations for steady fields. Using the concept of Faraday's law and displacement current modify them for time varying fields.	**07**
	(b)	Write a detailed note on Magnetization and Permeability	**07**

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