Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–IV EXAMINATION – WINTER 2015

Subject Code:X40904 **Date:29/12/2015**

Subject Name: Theory of Electromagnetics

Time: 02:30pm to 05:00pm **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) A vector is given in cartesian system by $F = F_x a_x + F_y a_y + F_z a_z$. Find its cylindrical and spherical equivalent (7)

(b) Let $E = 3a_y + 4a_z$ and $F = 4a_x – 10a_y + 5a_z$ (i) find component of E along F. (ii) Determine a unit vector perpendicular to the plane of vectors E and F (7)

Q.2

(a) Derive the expression for electric field intensity at a point on the z-axis due to infinite sheet which lies in z = 0 plane (7)

(b) Derive point form of continuity equation (7)

OR

(b) State and explain Gauss' law. Apply Gauss' law to find the charge enclosed inside the cylinder of radius ρ and height L. Assume that line charge of ρ_L C/m passes through centre of the cylinder (7)

Q.3

(a) Find the force on a point charge of 5 μC located at (0,0,5) due to charge of 500 π μC uniformly distributed over the disc $r \leq 5$m, z = 0 (8)

(b) Two uniform line charges of density $\rho_L = 4$ nC/m, lie in x = 0 plane at y = $\pm$ 4m. Find E at (4,0,z) (6)

OR

Q.3

(a) Explain the concept of divergence. Prove that $\nabla \cdot D = \rho_V$ and hence explain divergence theorem (8)

(b) Write a short note on electric dipole (6)

Q.4

(a) Define potential and potential difference. Prove that E = -grad V (8)

(b) Explain conductor properties and boundary conditions (6)

OR

Q.4

(a) Explain dielectric-dielectric boundary conditions. Also derive the relationship between electric flux densities in both the dielectrics (8)

(b) Discuss Poisson's and Laplace's equations (6)

Q.5

(a) What is curl? Prove that $\nabla \times H = J$ (8)

(b) Explain Ampere's circuital law and Stoke's theorem in brief (6)

OR

Q.5

(a) Discuss Maxwell's equations in integral form and point form (8)

(b) Explain the following in brief (i) Diamagnetism (ii) Paramagnetism (iii) Ferromagnetism (6)