Seat No.: ________ Enrolment No.___________

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (OLD) EXAMINATION – WINTER 2018

Subject Code:160906 **Date: 27/11/2018**

Subject Name: Theory of 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.**
4. **Symbols have their usual meanings**

Q.1

(a) Discuss cylindrical and spherical co-ordinate systems (7)

(b) Given vectors $A = 2a_x + 4a_y + 10a_z$ and $B = -5a_\rho + 1a_\Phi - 3a_z$, do the following (7)

(i) Convert B into cartesian system at (5,0,2) and then find A+B

(ii) Find the angle between A and B at P

(iii) Find the scalar component of A along B at P

Q.2

(a) Explain Coulomb's law. Using this law find the vector force on 0.7 mC charge at (2,3,6) due to 4.9 μC charge located at (0,0,0) (7)

(b) Derive the expression for electric field intensity due to continuous sheet charge (7)

OR

(b) A sheet charge of $\rho_s = 2$ nC/m^2 is present at x = 3 in free space and a line charge $\rho_L = 20$nC/m is located at x = 1, z = 4. Find (i) the magnitude of electric field intensity at the origin (ii) E at (4,5,6) (7)

Q.3

(a) Derive differential or point form of Gauss' law and hence state divergence theorem (7)

(b) Discuss how Coulomb's Torsional balance can be used to measure small forces (7)

OR

Q.3

(a) Define potential and potential difference. Explain how potential difference between two points can be found out due to infinite line charge (7)

(b) Derive the expression for electric and potential fields due to electric dipole (7)

Q.4

(a) Discuss boundary conditions for perfect dielectric materials (7)

(b) What is capacitance? Explain how capacitance can be found out for parallel plate capacitor ? (7)

OR

Q.4

(a) Discuss Poisson's and Laplace's equations (7)

(b) With the help of neat diagram explain the working of electrostatic precipitator (7)

Q.5

(a) Prove that $\nabla \times H = J$ for steady magnetic fields (7)

(b) Explain Maxwell's equations in integral and point form (7)

OR

Q.5

(a) Write a short notes on any two from the following (7)

(i) Watt Hour meter (ii) Magnetic levitation (iii) Induction heating

(b) What is FDM? List out the steps for solving differential equations using FDM (7)

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