

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-IV (New) EXAMINATION – WINTER 2015

Subject Code: 2140909

Date: 01/01/2016

Subject Name: Field Theory

Time: 2:30pm to 5:00pm

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)** Explain Cartesian co-ordinate system along with the equations of differential length, differential surfaces and differential volume elements. **07**
- (b)** The given points are A ($x = 2, y = 3, z = -1$) and B ($r = 4, \theta = 25^\circ, \phi = 120^\circ$). Find (i) Spherical co-ordinates of A (ii) Cartesian co-ordinates of B and (iii) Distance from A to B. **07**
- Q.2 (a)** An infinite uniform line charge having line charge density of $\rho_L = 200 \text{ nC/m}$ placed on the z-axis. Find the total electric field intensity at $(6, 8, 3) \text{ m}$. **07**
- (b)** Derive the expression of E (Electric field intensity) at any point P due to infinite uniform line charge distribution in free space. **07**
- OR**
- (b)** A circular ring with radius of 5 m lies on $z = 0$ plane with its centre at origin. If $\rho_L = 10 \text{ nC/m}$, find value of a point charge Q placed at origin which will produce the same value of E (Electric field intensity) at point $(0, 0, 5) \text{ m}$. **07**
- Q.3 (a)** Define divergence and its physical significance. **07**
- (b)** Derive expression of electric field intensity due to an electric dipole. **07**
- OR**
- Q.3 (a)** Derive Maxwell's first equation applied to electrostatic using Gauss's law. **07**
- (b)** Derive relationship between potential and electric field intensity. **07**
- Q.4 (a)** State and explain Ampere's circuital law. **07**
- (b)** Explain boundary conditions between two perfect dielectric materials. **07**
- OR**
- Q.4 (a)** State Maxwell's equations in integral form and explain physical significance of the equations. **07**
- (b)** Derive the relation between I and J . **07**
- Q.5 (a)** Derive Poisson's and Laplace's equations. **07**
- (b)** Derive Lorentz Force Equation. **07**
- OR**
- Q.5 (a)** Write a short note on EMI & EMC. **07**
- (b)** Describe the physical description of transmission line propagation. **07**
