

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER 2013****Subject Code: 151002****Date: 21-05-2013****Subject Name: Engineering Electromagnetic****Time: 10.30 am - 01.00 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) Explain Cross Product & Dot Product in detail. **04**
 (b) Explain Position and distance vectors with suitable example. **04**
 (c) Define followings: 1. Electric Flux Density 2. Potential 3. Field **06**
- Q.2** (a) Given vectors $A = 3a_x + 4a_y + a_z$ and $B = 2a_y - 5a_z$, find the angle between A and B. **04**
 (b) Given point P (\hat{r} 2, 6, 3) and vector $A = ya_x + (x + z) a_y$, express P and A in cylindrical and spherical coordinates. Evaluate A at P in the Cartesian, cylindrical, and spherical systems. **07**
- OR**
- (b) Explain spherical coordinate system. **07**
 (c) Explain Coulomb's Law and Field Intensity with suitable example. **03**
- Q.3** (a) Given the potential $V = 10/r^2 \sin \cos$ **06**
 (1) Find the electric flux density D at (2, $\sqrt{2}$, 0).
 (2) Calculate the work done in moving a 10 μ C charge from point A (1, 30°, 120°) to B (4, 90°, 60°).
 (b) Write short notes on potential gradient. Find the gradient of the following scalar field $= e^{-z} \sin 2x \cosh y$. **05**
 (c) Explain the Electric Dipole. **03**
- OR**
- Q.3** (a) Write a short note on Divergence Theorem with suitable example **04**
 (b)
$$\nabla \cdot \mathbf{J} = -\frac{\partial \rho_v}{\partial t}$$
 ; Continuity of current equation. **06**
 Prove that
 (c) Write down a Point and integral forms of Maxwell's equations for steady electric and magnetic fields. **04**
- Q.4** (a) Determine magnetic Field intensity H for Infinitely Long Coaxial Transmission Line. **07**
 (b) Write down a statement of Biot-Savart's law and explain in detail **07**
- OR**
- Q.4** (a) write short notes on magnetic boundary conditions **06**
 (b) A parallel-plate capacitor with plate area of 5 cm² and plate separation of 3 mm has a voltage 50 sin 10³tV applied to its plates. Calculate the displacement current assuming $\epsilon = 2 \epsilon_0$. **04**
 (c) What do you mean by skin depth? Explain in brief. **04**
- Q.5** (a) The electric field in free space is given by $E = 50 \cos (10^8 t + \beta x) a_y$ V/m **07**
 (1) Find the direction of wave propagation.
 (2) Calculate β and the time it takes to travel a distance of $\sqrt{2}$.
 (b) Write down a general procedure for solving poisson's or laplace's equation & also explain a Uniqueness theorem. **07**
- OR**
- Q.5** (a) Explain plane waves in free space. **07**
 (b) In free space ($z \geq 0$), a plane wave with $H = 10 \cos (10^8 t - z) a_x$ mA/m **07**
 is incident normally on a lossless medium ($\epsilon = 2 \epsilon_0$, $\mu = 8 \mu_0$) in region $z < 0$. Determine the reflected wave H_r E_r and the transmitted wave H_t , E_t .