

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER • 2014****Subject Code: 151002****Date: 19-06-2014****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.
4. Underlined and a followed by coordinate variable are vector Quantity

- Q.1** (a) Given the vectors $\underline{M} = -10\hat{a}_x + 4\hat{a}_y - 8\hat{a}_z$ and $\underline{N} = 8\hat{a}_x + 7\hat{a}_y - 2\hat{a}_z$, find: a) a unit vector in the direction of $-\underline{M} + 2\underline{N}$. b) the magnitude of $5\hat{a}_x + \underline{N} - 3\underline{M}$ c) $|\underline{M}| |\underline{N}| (\underline{M} + \underline{N})$: **07**
 (b) Explain experimental law of coulomb and from that deduce expression for electric field intensity for point charges. **07**

- Q.2** (a) Let $V = 2xy^2z^3 + 3 \ln(x^2 + 2y^2 + 3z^2)$ V in free space. Evaluate each of the following quantities at $P(3, 2, -1)$: a) V b) $|\underline{V}|$ and c) \underline{E} **07**
 (b) Apply Gauss's law for finding electric field for some symmetric charge distribution **07**

OR

- (b) Using Gauss's law for differential volume element prove that $\text{div } \underline{D} = \rho_v$. **07**
- Q.3** (a) The magnetic field intensity is given in the square region $x = 0, 0.5 < y < 1, 1 < z < 1.5$ By $\underline{H} = z^2\hat{a}_x + x^3\hat{a}_y + y^4\hat{a}_z$ A/m. a) evaluate $\oint \underline{H} \cdot d\underline{L}$ about the perimeter of the square region b) Find $\underline{\nabla} \times \underline{H}$: c) Calculate $(\underline{\nabla} \times \underline{H})_x$ **07**
 (b) Explain Point and integral form of Maxwell's Equations. **07**

OR

- Q.3** (a) What are different representation of emf used by Faraday using it define curl of Electric field. **07**
 (b) State and explain Biot-Savart Law **07**
- Q.4** (a) Write short note on magnetic boundary conditions. **07**
 (b) Derive Poisson's and Laplace's Equation. **07**

OR

- Q.4** (a) Write short note on boundary condition for perfect dielectric **07**
 (b) Show that solution of the Laplace's equation is unique. **07**
- Q.5** (a) Define Lorentz force and obtain force on current element using it. **07**
 (b) Explain in detail about Wave motion in free space **07**

OR

- Q.5** (a) Conducting planes in air at $z = 0$ and $z = d$ carry surface currents of $\pm K_0\hat{a}_x$ A/m. **07**
 a) Find the energy stored in the magnetic field per unit length ($0 < x < 1$) in a width w ($0 < y < w$) b) Calculate the inductance per unit length
 (b) State and prove Pointing vector theorem using it for propagation in z direction find power. **07**
