Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B.Tech.

Branch	**: EEE**	**Semester**	**: 3rd**
Title of the Course	**: Electro Magnetic Field Theory**	**Course Code**	**: EEL 203**

Time: 2 Hours **Maximum Marks: 25**

Note : 1. All the 6 questions are compulsory. Make suitable assumptions wherever required.
2. All the symbols have their usual meaning.

Q1. Given that $\vec{U} = y\hat{a}_x + x\hat{a}_y + \frac{x^2}{\sqrt{x^2+y^2}}\hat{a}_z$. Transform $\vec{U}$ from Cartesian to cylindrical coordinates. **4 Marks**

Q2. Given that $\vec{D} = \frac{5r^2}{4}\hat{a}_r$ (C/m^2) in spherical coordinates. Verify the divergence theorem for the volume enclosed by $r = 4$ m and $\theta = \frac{\pi}{4}$. **4 Marks**

Q3. Find the force on a point charge of 50 μC at (0, 0, 5) m due to a charge of 500π μC that is uniformly distributed over the circular disk $\rho \leq 5$ m, $z = 0$ m. **4 Marks**

Q4. A charge of uniform density $\rho_s = 0.3$ nC/m^2 covers the plane $2x - 3y + z = 6$ m. Find $\vec{E}$ on the side of the plane containing the origin. **5 Marks**

Q5. Determine the flux crossing a 1 mm by 1 mm area on the surface of a cylindrical shell at $\rho = 10$ m, $z = 2$ m, $\varphi = 53.2^0$ if **4 Marks**

$$\vec{D} = 2x\hat{a}_x + 2(1-y)\hat{a}_y + 4z\hat{a}_z \ \text{(C/m}^2\text{)}$$

Q6. Prove that the vector field $\vec{U}$ is conservative if the line integral of the tangential component of $\vec{U}$ around any closed path is zero. **4 Marks**