NAME: S.No. ID:
Maximum Marks: 10 Section:01 Time Allowed: 30 minutes

(1) Express the point $P(1, 1, 1)$ and the vector $\mathbf{A} = y \mathbf{a}_x + (x + z) \mathbf{a}_z$ in cylindrical coordinates. Evaluate $\mathbf{A}$ at $P$ in Cartesian and cylindrical systems.

(2) Find the directional derivative of $V = r \sin(\theta) \cos(\phi)$ in the direction of $3\mathbf{a}_x - 4\mathbf{a}_z$ at the point $P(1, \frac{\pi}{6}, \frac{\pi}{2})$. [Hint: $\nabla V = \frac{\partial V}{\partial r} \mathbf{a}_r + \frac{1}{r} \frac{\partial V}{\partial \theta} \mathbf{a}_\theta + \frac{1}{r \sin \theta} \frac{\partial V}{\partial \phi} \mathbf{a}_\phi$]