

Quiz 2: Index Notation,

September 3, 2025

Q1.- Which one of the following is correct?

- (a) $u_i + v_j = c_k$
- (b) $u_i + v_i = c_k$
- (c) $u_i + v_i = c_i \quad \Leftarrow \text{This one is correct.}$

Q2.- Which one of the following is correct?

- (a) $\vec{u} \cdot \vec{v} = u_i v_i \quad \Leftarrow \text{This one is correct.}$
- (b) $\vec{u} \cdot \vec{v} = u_i v_j$
- (c) $\vec{u} \cdot \vec{v} = \sum_{n=0}^n = 3u_n v_i$

Q3.- Which one of the following is correct?

- (a) $\epsilon_{ijk} = -\epsilon_{jki}$
- (b) $\epsilon_{ijk} = \epsilon_{jki} \quad \Leftarrow \text{This one is correct.}$
- (c) $\epsilon_{ijk} = \epsilon_{jik}$

Q4.- Write in index notation the following expressions:

$$(a) \vec{\nabla} \cdot \vec{u} \qquad (b) \vec{\nabla} \times \vec{u} \qquad (1)$$

Solution:

$$\vec{\nabla} \cdot \vec{u} = \frac{\partial u_i}{\partial x_i} \qquad (2)$$

$$\vec{\nabla} \times \vec{u} = \epsilon_{ijk} \frac{\partial u_k}{\partial x_j} \qquad (3)$$

Q5.- What is the result of

$$\delta_{ij}u_i \quad (4)$$

Solution:

$$\delta_{ij}u_i = u_j \quad (5)$$

Q5.- What is the condition for an Irrotational flow?

Solution:

$$\vec{\omega} = 0 \quad \text{or} \quad \frac{\partial u_i}{\partial x_j} = 0. \quad (6)$$