

Let $\vec{\mathbf{u}}, \vec{\mathbf{v}}$ and $\vec{\mathbf{w}}$ be vectors such that $\vec{\mathbf{u}} + \vec{\mathbf{v}} + \vec{\mathbf{w}} = \vec{\mathbf{0}}$. If $|\vec{\mathbf{u}}| = 3, |\vec{\mathbf{v}}| = 4$ and $|\vec{\mathbf{w}}| = 5$, then $\vec{\mathbf{u}} \cdot \vec{\mathbf{v}} + \vec{\mathbf{v}} \cdot \vec{\mathbf{w}} + \vec{\mathbf{w}} \cdot \vec{\mathbf{u}}$ is

(1995, 2M)

(a) 47

(b) -25

(c) 0

(d) 25

$$\text{Since, } \vec{\mathbf{u}} + \vec{\mathbf{v}} + \vec{\mathbf{w}} = \vec{\mathbf{0}} \Rightarrow |\vec{\mathbf{u}} + \vec{\mathbf{v}} + \vec{\mathbf{w}}|^2 = 0$$

$$\Rightarrow |\vec{\mathbf{u}}|^2 + |\vec{\mathbf{v}}|^2 + |\vec{\mathbf{w}}|^2 + 2(\vec{\mathbf{u}} \cdot \vec{\mathbf{v}} + \vec{\mathbf{v}} \cdot \vec{\mathbf{w}} + \vec{\mathbf{w}} \cdot \vec{\mathbf{u}}) = 0$$

$$\Rightarrow 9 + 16 + 25 + 2(\vec{\mathbf{u}} \cdot \vec{\mathbf{v}} + \vec{\mathbf{v}} \cdot \vec{\mathbf{w}} + \vec{\mathbf{w}} \cdot \vec{\mathbf{u}}) = 0$$

$$\Rightarrow \vec{\mathbf{u}} \cdot \vec{\mathbf{v}} + \vec{\mathbf{v}} \cdot \vec{\mathbf{w}} + \vec{\mathbf{w}} \cdot \vec{\mathbf{u}} = -25$$