# 12.478

EE25BTECH11049 - Sai Krishna Bakki

**Question:**

A force $\mathbf{P} = \begin{pmatrix} 2 \\ -5 \\ 6 \end{pmatrix}$ acts on a particle. The particle is moved from point **A** to point **B**, where the position vectors of **A** and **B** are $\begin{pmatrix} 6 \\ 1 \\ -3 \end{pmatrix}$ and $\begin{pmatrix} 4 \\ -3 \\ -2 \end{pmatrix}$ respectively. The work done is

**Solution:**

Given

$$\text{Force } \mathbf{P} = \begin{pmatrix} 2 \\ -5 \\ 6 \end{pmatrix}, \mathbf{A} = \begin{pmatrix} 6 \\ 1 \\ -3 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 4 \\ -3 \\ -2 \end{pmatrix} \tag{1}$$

Work done is given by

$$\mathbf{P}^T (\mathbf{B} - \mathbf{A}) \tag{2}$$

$$\implies \begin{pmatrix} 2 & -5 & 6 \end{pmatrix} \left( \begin{pmatrix} 4 \\ -3 \\ -2 \end{pmatrix} - \begin{pmatrix} 6 \\ 1 \\ -3 \end{pmatrix} \right) \tag{3}$$

$$\implies \begin{pmatrix} 2 & -5 & 6 \end{pmatrix} \begin{pmatrix} -2 \\ -4 \\ 1 \end{pmatrix} \tag{4}$$

$$\implies -4 + 20 + 6 = 22 \tag{5}$$

$\therefore$ The work done is 22 J.

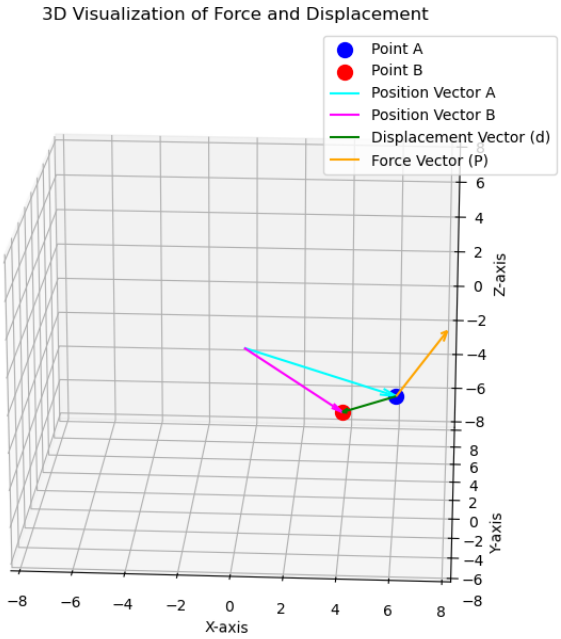
3D Visualization of Force and Displacement
Point A
Point B
Position Vector A
Position Vector B
Displacement Vector (d)
Force Vector (P)
X-axis
Y-axis
Z-axis

Fig. 1