ASSIGNMENT 5

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Download all python codes from

https://github.com/CRAMYATULASI/ASSIGNMENT4/tree/main/ASSIGNMENT5/CODES

and latex-tikz codes from

https://github.com/CRAMYATULASI/ASSIGNMENT5/tree/main/ASSIGNMENT5

1 Question No 2.56

Find the equation of the plane which contains the line of intersection of the planes

$$\begin{pmatrix}1 & 2 & 3\end{pmatrix}\mathbf{x} = 4 \tag{1.0.1}$$

$$\begin{pmatrix}2 & 1 & -1\end{pmatrix}\mathbf{x} = -5 \tag{1.0.2}$$

and which is perpendicular to the plane

$$\begin{pmatrix}5 & 3 & -6\end{pmatrix}\mathbf{x} = -8 \tag{1.0.3}$$

2 SOLUTION

Equation of plane containing line of intersection of given planes (1.0.1) and (1.0.2) is

$$\begin{pmatrix}1 & 2 & 3\end{pmatrix}\mathbf{x} + \lambda\begin{pmatrix}2 & 1 & -1\end{pmatrix}\mathbf{x} = 4 - 5\lambda \tag{2.0.1}$$

$$\implies \begin{pmatrix}1+2\lambda & 2+\lambda & 3-\lambda\end{pmatrix}\mathbf{x} = 4 - 5\lambda \tag{2.0.2}$$

But (2.0.2) is perpendicular to (1.0.3) so,angle between planes is 90°.

$$\cos 90^\circ = \frac{a^T b}{\|a\|\,\|b\|} \implies a^T b = 0 \tag{2.0.3}$$

$$\implies \begin{pmatrix}1+2\lambda\\2+\lambda\\3-\lambda\end{pmatrix}\begin{pmatrix}5 & 3 & -6\end{pmatrix} = 0 \tag{2.0.4}$$

$$\implies 5(1+2\lambda) + 3(2+\lambda) - 6(3-\lambda) = 0 \tag{2.0.5}$$

$$\implies 19\lambda - 7 = 0 \implies \lambda = \frac{7}{19} \tag{2.0.6}$$

$\therefore$ By substituting λ value in (2.0.2) we get required plane equation as,

$$\begin{pmatrix}33 & 45 & 50\end{pmatrix}\mathbf{x} = 41 \tag{2.0.7}$$