ASSIGNMENT 5

C.RAMYA TULASI

Latex-tikz codes from

1 QUESTION No 2.56

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

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

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

and which is perpendicular to the plane

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

2 SOLUTION

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

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

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

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

$$\cos 90° = \frac{a^T b}{\|a\|\,\|b\|} \implies a^T b = 0 \quad (2.0.3)$$

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

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

$$\implies 19\lambda - 7 = 0 \implies \lambda = \frac{7}{19} \quad (2.0.6)$$

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

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