12.11.4.3

Question : Find the angle between the lines whose direction ratios are a, b, c and $b-c, c-a, a-b$.

Solution :

$$\mathbf{m_1} = \begin{pmatrix} a \\ b \\ c \end{pmatrix} \tag{1}$$

$$\mathbf{m_2} = \begin{pmatrix} b-c \\ c-a \\ a-b \end{pmatrix} \tag{2}$$

$$\cos\theta = \frac{\left(\mathbf{m_1}^\top\right)\mathbf{m_2}}{||\mathbf{m_1}||||\mathbf{m_2}||} \tag{3}$$

$$= \frac{\begin{pmatrix} a & b & c \end{pmatrix}\begin{pmatrix} b-c \\ c-a \\ a-b \end{pmatrix}}{\sqrt{a^2+b^2+c^2}\sqrt{(b-c)^2+(c-a)^2+(a-b)^2}} \tag{4}$$

$$= 0 \tag{5}$$

$$or, \theta = \frac{\pi}{2} \tag{6}$$