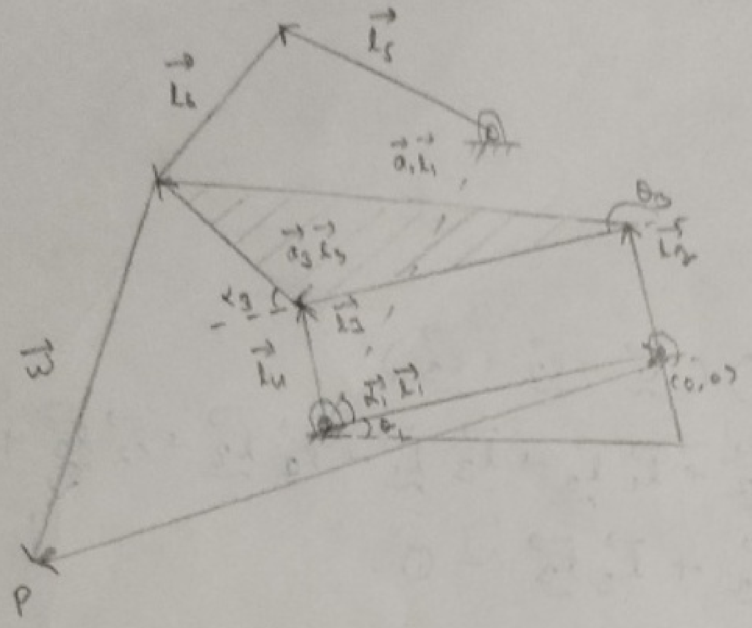

Assumptions :-

$\vec{p1} = -4.84 - 6.37i;$

$\vec{p2} = -7.75 - 6.6i;$

$\vec{p3} = -12.39 - 7.09i;$

$\vec{p4} = -11.02 - 4.68i;$

$\vec{p5} = -8.08 - 4.36i;$

$\theta_2^{01} = 1.39$

$\theta_2^{02} = 3.14$

$\theta_2^{03} = 3.92$

$\theta_2^{04} = 4.88$

$\lambda_1 = 5e^{i(0.26)}$

Loop closure equation

Loop 1:-

$$\vec{l_1} + \vec{l_2} + \vec{l_3} - \vec{l_4} = 0$$

$$\vec{l_4} = \vec{l_1} + \vec{l_2} + \vec{l_3}$$

$$\vec{l_4}\,\underset{\sim}{l_4} = (\vec{l_1} + \vec{l_2} + \vec{l_3})(\underset{\sim}{l_1} + \underset{\sim}{l_2} + \underset{\sim}{l_3})$$

$$= \vec{l_1}\,\underset{\sim}{l_1} + \vec{l_1}\,\underset{\sim}{l_2} + \vec{l_1}\,\underset{\sim}{l_3} + \vec{l_3}\,\underset{\sim}{l_1} + \vec{l_2}\,\underset{\sim}{l_2} + \vec{l_2}\,\underset{\sim}{l_3} +$$

$$\vec{l_3}\,\underset{\sim}{l_1} + \vec{l_3}\,\underset{\sim}{l_2} + \vec{l_3}\,\underset{\sim}{l_3} \quad - (1)$$

$$\vec{l_4} e^{i\theta_4^{01}} = \vec{l_1} + \vec{l_2} e^{i\theta_2^{01}} + \vec{l_3} e^{i\theta_3^{01}}$$

$$\vec{l_4}\,\underset{\sim}{l_4} = (\vec{l_1} + \vec{l_2}\, i^{\theta_2^{01}} + \vec{l_3} e^{i\theta_3^{01}})(\underset{\sim}{l_1} + \underset{\sim}{l_2} e^{-i\theta_2^{01}} + \underset{\sim}{l_3} e^{-i\theta_3^{01}})$$

$$= \vec{l_1}\,\vec{l_1} + \vec{l_1}\,\underset{\sim}{l_2} e^{-i\theta_2^{01}} + \vec{l_1}\,\underset{\sim}{l_3} e^{-i\theta_3^{01}} + \vec{l_2} e^{i\theta_2^{01}}\,\underset{\sim}{l_1}$$

$$+ \vec{l_2}\,\underset{\sim}{l_2} + \vec{l_2}\,\underset{\sim}{l_3}\, e^{i(\theta_2^{01} - \theta_3^{01})} + \vec{l_3} e^{i\theta_3^{01}}\,\underset{\sim}{l_1} +$$

$$\vec{l_3}\,\underset{\sim}{l_2}\, e^{i(\theta_3^{01} - \theta_2^{01})} + \vec{l_3}\,\vec{l_3} \quad - (2)$$

$$\vec{l_4} e^{i\theta_4^{02}} = \vec{l_1} + \vec{l_2} e^{i\theta_2^{02}} + \vec{l_3} e^{i\theta_3^{02}}$$

$$\vec{l_4}\,\underset{\sim}{l_4} = (\vec{l_1} + \vec{l_2}\, i^{\theta_2^{02}} + \vec{l_3} e^{i\theta_3^{02}})(\underset{\sim}{l_1} + \underset{\sim}{l_2} e^{-i\theta_2^{02}} + \underset{\sim}{l_3} e^{-i\theta_3^{02}})$$

$$= \vec{l_1}\,\vec{l_1} + \vec{l_1}\,\underset{\sim}{l_2} e^{-i\theta_2^{02}} + \vec{l_1}\,\underset{\sim}{l_3} e^{-i\theta_3^{02}} + \vec{l_2} e^{i\theta_2^{02}}\,\underset{\sim}{l_1}$$

$$+ \vec{l_2}\,\underset{\sim}{l_2} + \vec{l_2}\,\underset{\sim}{l_3}\, e^{i(\theta_2^{02} - \theta_3^{02})} + \vec{l_3} e^{i\theta_3^{02}}\,\underset{\sim}{l_1} +$$

$$\vec{l_3}\,\underset{\sim}{l_2}\, e^{i(\theta_3^{02} - \theta_2^{02})} + \vec{l_3}\,\vec{l_3} \quad - (3)$$

$$② - ① \Rightarrow \vec{l}_1 \underset{\sim}{\vec{l}_3}\left(e^{-i\theta_3^{01}} - 1\right) + \vec{l}_1 \underset{\sim}{\vec{l}_3}\left(e^{-i\theta_3^{01}} - 1\right) + \underset{\sim}{\vec{l}_1} \vec{l}_2 \left(e^{i\theta_2^{01}} - 1\right)$$

$$+ \underset{\sim}{\vec{l}_1} \vec{l}_3 \left(e^{i\theta_3^{01}} - 1\right) + \vec{l}_2 \underset{\sim}{\vec{l}_3}\left(e^{i(\theta_2^{01} - \theta_3^{01})} - 1\right) + l_3 \underset{\sim}{\vec{l}_2}\left(e^{i(\theta_3^{01} - \theta_2^{01})}\right.$$

$$\left. - 1\right) = 0$$

$$③ - ① \Rightarrow l_1 \underset{\sim}{\vec{l}_3}\left(e^{-i\theta_3^{02}} - 1\right) + \vec{l}_1 \underset{\sim}{\vec{l}_3}\left(e^{-i\theta_3^{02}} - 1\right) + \underset{\sim}{\vec{l}_1} \vec{l}_2 \left(e^{i\theta_2^{02}} - 1\right)$$

$$+ \underset{\sim}{\vec{l}_1} \vec{l}_3 \left(e^{i\theta_3^{02}} - 1\right) + \vec{l}_2 \underset{\sim}{\vec{l}_3}\left(e^{i(\theta_2^{02} - \theta_3^{02})} - 1\right) + l_3 \underset{\sim}{\vec{l}_2}\left(e^{i(\theta_3^{02} - \theta_2^{02})} - 1\right)$$

$$= 0$$

$$\vec{l_4} e^{i\theta_4^{03}} = \vec{l_1} + \vec{l_2} e^{i\theta_2^{03}} + \vec{l_3} e^{i\theta_3^{03}}$$

$$\vec{l_4} \underset{\sim}{\vec{l_4}} = (\vec{l_1} + \vec{l_2} e^{i\theta_2^{03}} + \vec{l_3} e^{i\theta_3^{03}}) (\underset{\sim}{\vec{l_1}} + \underset{\sim}{\vec{l_2}} e^{-i\theta_2^{03}} + \underset{\sim}{\vec{l_3}} e^{-i\theta_3^{03}})$$

$$= \vec{l_1} \vec{l_1} + \vec{l_1} \underset{\sim}{\vec{l_2}} e^{-i\theta_2^{03}} + \vec{l_1} \underset{\sim}{\vec{l_3}} e^{-i\theta_3^{03}} + \vec{l_2} e^{i\theta_2^{03}} \underset{\sim}{\vec{l_1}} + \vec{l_2} \underset{\sim}{\vec{l_2}} + \vec{l_2} \underset{\sim}{\vec{l_3}} e^{i(\theta_2^{03} - \theta_3^{03})} + \vec{l_3} e^{i\theta_3^{03}} \underset{\sim}{\vec{l_1}} + \vec{l_3} \underset{\sim}{\vec{l_2}} e^{i(\theta_3^{03} - \theta_2^{03})} + \vec{l_3} \vec{l_3} \quad - (4)$$

$$(4) - (1) \Rightarrow l_1 \underset{\sim}{\vec{l_3}} (e^{-i\theta_2^{03}} - 1) + \vec{l_1} \underset{\sim}{\vec{l_3}} (e^{-i\theta_3^{03}} - 1) + \underset{\sim}{\vec{l_1}} \vec{l_2} (e^{i\theta_2^{03}} - 1) + \underset{\sim}{\vec{l_1}} \vec{l_3} (e^{i\theta_3^{03}} - 1) + \vec{l_2} \underset{\sim}{\vec{l_3}} (e^{i(\theta_2^{03} - \theta_3^{03})} - 1) + l_3 \underset{\sim}{\vec{l_2}} (e^{i(\theta_3^{03} - \theta_2^{03})} - 1)$$

$$= 0$$

Loop 2:

$c_1 = p_1 - l_2 - l_3$;

$c_2 = p_2 - l_2 e^{(i\theta_2^{01})} - l_3 e^{(i\theta_3^{01})}$

$c_3 = p_3 - l_2 e^{(i\theta_2^{02})} - l_3 e^{(i\theta_3^{02})}$

$a_3 \cos\alpha + w\cos\beta = re(c_1)$

$a_3 \sin\alpha + w\sin\beta = im(c_1)$

$a_3 \cos(\theta_3^{01} + \alpha) + w\cos(\beta + \theta_6^{01}) = re(c_2)$

$a_3 \sin(\theta_3^{01} + \alpha) + w\sin(\beta + \theta_6^{01}) = im(c_2)$

$a_3 \cos(\theta_3^{02} + \alpha) + w\cos(\beta + \theta_6^{02}) = re(c_3)$

$a_3 \sin(\theta_3^{02} + \alpha) + w\sin(\beta + \theta_6^{02}) = im(c_3)$

used vpasolve to solve the above equations.

Loop 3 :-

$$\vec{l_4} + \vec{a_3} - \vec{l_6} - \vec{l_5} - \vec{a_1}\vec{l_1} = 0$$

$$\vec{l_6} + \vec{l_5} - \vec{a_1}\vec{l_1} = \vec{l_4} + \vec{a_3} \quad - (1)$$

$$\vec{l_6}\, e^{i\theta_6^{01}} + \vec{l_5}\, e^{i\theta_5^{01}} - \vec{a_1}\vec{l_1} = \vec{l_4}\, e^{i\theta_4^{01}} + \vec{a_3}\, e^{i\theta_3^{01}} \quad - (2)$$

$$\vec{l_6}\, e^{i\theta_6^{02}} + \vec{l_5}\, e^{i\theta_5^{02}} - \vec{a_1}\vec{l_1} = \vec{l_4}\, e^{i\theta_4^{02}} + \vec{a_3}\, e^{i\theta_3^{02}} \quad - (3)$$

$$\vec{l_6}\, e^{i\theta_6^{03}} + \vec{l_5}\, e^{i\theta_5^{03}} - \vec{a_1}\vec{l_1} = \vec{l_4}\, e^{i\theta_4^{03}} + \vec{a_3}\, e^{i\theta_3^{03}} \quad - (4)$$

$$\vec{l_6}\, e^{i\theta_6^{04}} + \vec{l_5}\, e^{i\theta_5^{04}} - \vec{a_1}\vec{l_1} = \vec{l_4}\, e^{i\theta_4^{04}} + \vec{a_3}\, e^{i\theta_3^{04}} \quad - (5)$$

$$(2) - (1) \Rightarrow \vec{l_6}\,(e^{i\theta_6^{01}} - 1) + \vec{l_5}\,(e^{i\theta_5^{01}} - 1) - \vec{l_4}\,(e^{i\theta_4^{01}} - 1)$$
$$+ \vec{a_3}\,(e^{i\theta_3^{01}} - 1)$$

$\rightarrow$

$$(3) - (1) \Rightarrow \vec{l_6}\,(e^{i\theta_6^{02}} - 1) + l_5\,(e^{i\theta_5^{02}} - 1) = \vec{l_4}\,(e^{i\theta_4^{02}} - 1) + \vec{a_3}\,(e^{i\theta_3^{02}} - 1)$$

$$(4) - (1) \Rightarrow \vec{l_6}\,(e^{i\theta_6^{03}} - 1) + l_5\,(e^{i\theta_5^{03}} - 1) = \vec{l_4}\,(e^{i\theta_4^{03}} - 1) + \vec{a_3}\,(e^{i\theta_3^{03}} - 1)$$

$$(5) - (1) \Rightarrow \vec{l_6}\,(e^{i\theta_6^{04}} - 1) + l_5\,(e^{i\theta_5^{04}} - 1) = \vec{l_4}\,(e^{i\theta_4^{04}} - 1) + \vec{a_3}\,(e^{i\theta_3^{04}} - 1)$$

used vpasolve to solve the above equations.