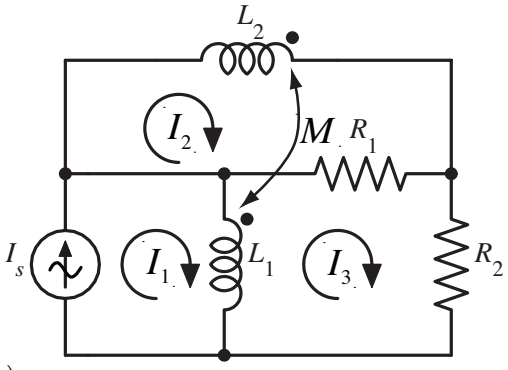
Solution of ECE 202 Test 6 S13

With reference to the circuit below, fill in the blanks in the mesh equations with correct numerical magnitudes and angles. (As usual, magnitudes must be non-negative and angles should be in the range -180° to +180°.)

$$\begin{array}{l}\text{Mesh 2} \rightarrow \\ \text{Mesh 3} \rightarrow \\ \text{Auxiliary} \rightarrow\end{array}\begin{bmatrix} \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ \\ \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ 4\angle 0^\circ \end{bmatrix}$$

$I_s = 4\angle 0^\circ$ A , $L_1 = 2.5$ H , $L_2 = 4$ H , $M = 2$ H

$R_1 = 240\Omega$, $R_2 = 350\Omega$, $\omega = 200$ s^{-1}



$$j\omega L_2 I_2 - j\omega M\left(I_1 - I_3\right) + R_1\left(I_2 - I_3\right) = 0$$

$$j\omega L_1\left(I_3 - I_2\right) + j\omega M I_2 + R_1\left(I_3 - I_2\right) + R_2 I_3 = 0$$

$$I_1 = I_s$$

$$\begin{bmatrix} -j\omega M & j\omega L_2 + R_1 & j\omega M - R_1 \\ -j\omega L_1 & j\omega M - R_1 & j\omega L_1 + R_1 + R_2 \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ I_s \end{bmatrix}$$

$$\begin{bmatrix} -j400 & j800 + 240 & j400 - 240 \\ -j500 & j400 - 240 & j500 + 590 \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ 4 \end{bmatrix}$$

$$\begin{array}{l}\text{Mesh 2} \rightarrow \\ \text{Mesh 3} \rightarrow \\ \text{Auxiliary} \rightarrow\end{array}\begin{bmatrix} 400\angle -90^\circ & 835\angle 73.3^\circ & 466.48\angle 120.96^\circ \\ 500\angle -90^\circ & 466.48\angle 120.96^\circ & 773.37\angle 40.28^\circ \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ 4\angle 0^\circ \end{bmatrix}$$

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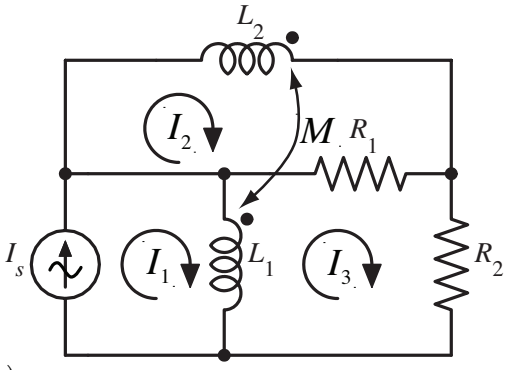
With reference to the circuit below, fill in the blanks in the mesh equations with correct numerical magnitudes and angles. (As usual, magnitudes must be non-negative and angles should be in the range -180° to +180°.)

$$\begin{array}{l}\text{Mesh 2} \rightarrow \\ \text{Mesh 3} \rightarrow \\ \text{Auxiliary} \rightarrow\end{array}\begin{bmatrix} \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ \\ \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ 4\angle 0^\circ \end{bmatrix}$$

$I_s = 4\angle 0^\circ$ A , $L_1 = 3.5$ H , $L_2 = 7$ H , $M = 4$ H

$R_1 = 280\Omega$, $R_2 = 310\Omega$, $\omega = 200$ s^{-1}



$$j\omega L_2 I_2 - j\omega M\left(I_1 - I_3\right) + R_1\left(I_2 - I_3\right) = 0$$

$$j\omega L_1\left(I_3 - I_2\right) + j\omega M I_2 + R_1\left(I_3 - I_2\right) + R_2 I_3 = 0$$

$$I_1 = I_s$$

$$\begin{bmatrix} -j\omega M & j\omega L_2 + R_1 & j\omega M - R_1 \\ -j\omega L_1 & j\omega M - R_1 & j\omega L_1 + R_1 + R_2 \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ I_s \end{bmatrix}$$

$$\begin{bmatrix} -j800 & j1400 + 280 & j800 - 280 \\ -j700 & j800 - 280 & j700 + 590 \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ 4 \end{bmatrix}$$

$$\begin{array}{l}\text{Mesh 2} \rightarrow \\ \text{Mesh 3} \rightarrow \\ \text{Auxiliary} \rightarrow\end{array}\begin{bmatrix} 800\angle -90^\circ & 1427.73\angle 78.69^\circ & 847.58\angle 109.29^\circ \\ 700\angle -90^\circ & 847.58\angle 109.29^\circ & 915.48\angle 49.87^\circ \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ 4\angle 0^\circ \end{bmatrix}$$

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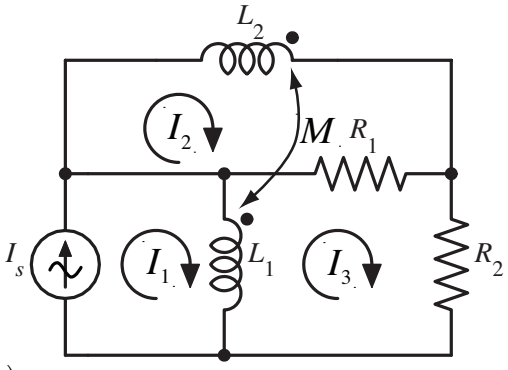
With reference to the circuit below, fill in the blanks in the mesh equations with correct numerical magnitudes and angles. (As usual, magnitudes must be non-negative and angles should be in the range -180° to +180°.)

$$\begin{array}{l}\text{Mesh 2} \rightarrow \\ \text{Mesh 3} \rightarrow \\ \text{Auxiliary} \rightarrow\end{array}\begin{bmatrix} \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ \\ \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ & \_\_\_\_\_\angle\_\_\_\_\_^\circ \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ 4\angle 0^\circ \end{bmatrix}$$

$I_s = 4\angle 0^\circ$ A , $L_1 = 1.5$ H , $L_2 = 3$ H , $M = 1$ H

$R_1 = 340\Omega$, $R_2 = 250\Omega$, $\omega = 200$ s^{-1}



$$j\omega L_2 I_2 - j\omega M\left(I_1 - I_3\right) + R_1\left(I_2 - I_3\right) = 0$$

$$j\omega L_1\left(I_3 - I_2\right) + j\omega M I_2 + R_1\left(I_3 - I_2\right) + R_2 I_3 = 0$$

$$I_1 = I_s$$

$$\begin{bmatrix} -j\omega M & j\omega L_2 + R_1 & j\omega M - R_1 \\ -j\omega L_1 & j\omega M - R_1 & j\omega L_1 + R_1 + R_2 \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ I_s \end{bmatrix}$$

$$\begin{bmatrix} -j200 & j600 + 340 & j200 - 340 \\ -j300 & j200 - 340 & j300 + 590 \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ 4 \end{bmatrix}$$

$$\begin{array}{l}\text{Mesh 2} \rightarrow \\ \text{Mesh 3} \rightarrow \\ \text{Auxiliary} \rightarrow\end{array}\begin{bmatrix} 200\angle -90^\circ & 689.64\angle 60.46^\circ & 394.46\angle 149.53^\circ \\ 300\angle -90^\circ & 394.46\angle 149.53^\circ & 661.89\angle 26.95^\circ \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}=\begin{bmatrix} 0 \\ 0 \\ 4\angle 0^\circ \end{bmatrix}$$