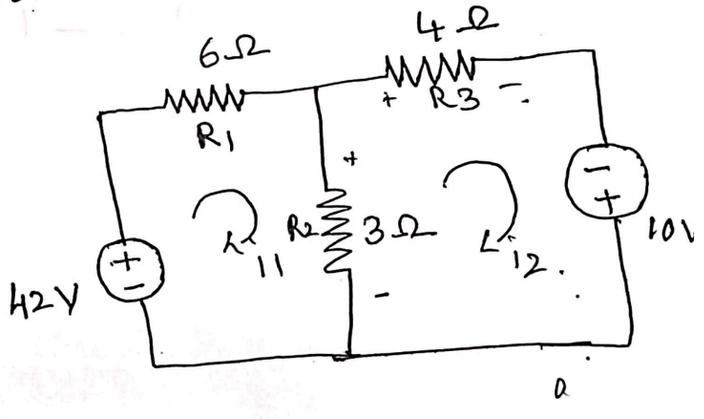
Mesh Analysis:-

The method in which the current flowing through a planar circuit is calculated.

If it is possible to draw the diagram of a circuit on a plane surface in such a way that no branch passes over (or) under any branch - then that circuit is said to be a planar circuit.

mesh:- A mesh should not contain any other loop within it.



Apply KVL to mesh 1:-

$$-42 + I_1(6) + 3(I_1 - i_2) = 0.$$

~~$I_1 R_1 + 3I_1 - 3i_2 = 42$~~

$$6I_1 + 3I_1 - 3I_2 = 42$$

$$9I_1 - 3I_2 = 42 \quad \text{---(1)}$$

Apply KVL to mesh 2.

$$-3(i_1 - i_2) + 4i_2 - 10V = 0.$$

$$-3i_1 + 3i_2 + 4i_2 = 10\,V.$$

$$-3i_1 + 7i_2 = 10\,V \quad \text{---(2)}$$

(5)

Solving these two equations we can find i_1 & i_2.

$$9I_1 - 3I_2 = 42 \quad \text{—①}$$

$$-3I_1 + 7I_2 = 10 \quad \text{—②}$$

$$②\times 3 \Rightarrow \quad -9I_1 + 21I_2 = 30 \quad \text{—③}$$

$$① + ③ \Rightarrow \quad 18I_2 = 72$$

$$I_2 = \frac{72}{18} = \frac{36}{9} \quad \frac{12}{3} = 4$$

$$I_2 = 4A.$$

$$① \Rightarrow \quad 9I_1 - (3\times 4) = 42.$$

$$9I_1 = 42 + 12$$

$$I_1 = \frac{54}{9} = 6.$$

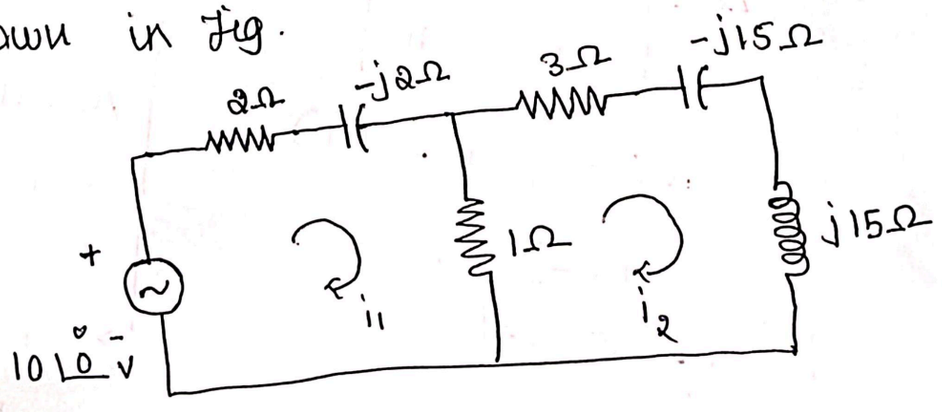
Mesh analysis for ac circuits

This is used to determine the node voltage or the branch current.

Branch current method	Both KCL & KVL
Loop current method	only KVL
Node voltage method	only KCL.

Loop current method :-

Apply the mesh current method and determine currents through the resistor of the network shown in fig.



(3) From loop 1,

$$(2-j2)i_1 + 1(i_1 - i_2) = 10\angle 0^\circ$$

$$2i_1 - j2i_1 + i_1 - i_2 = 10\angle 0^\circ$$

$$(3-j2)i_1 - i_2 = 10\angle 0^\circ \quad \text{—①}$$

From loop 2,

$$3i_2 - j1.5\,i_2 + j15\,\Omega i_2 + 1(i_2 - i_1) = 0$$

$$4i_2 + j14 - i_1 = 0 \quad \text{—②}$$

From ① and ②

$$\begin{bmatrix} 3-j2 & -1 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 10\angle 0^\circ \\ 0 \end{bmatrix}$$

Find Δ

$$\Delta = \begin{bmatrix} 3-j2 & -1 \\ -1 & 4 \end{bmatrix}$$

$$= (3-j2)4 - (1)$$

$$= 12 - j8 - 1$$

$$\boxed{\Delta = 11 - j8}$$

↓ Rectangular form.

Rectangular to polar

Rectangular Form $= x + jy$

Amplitude (Polar) $= \sqrt{x^2+y^2}$

Phase (Polar) $= \arctan\frac{y}{x}$

$\tan^{-1}$ inverse of tan

$13.60\angle -36.03^\circ$

→ polar form.