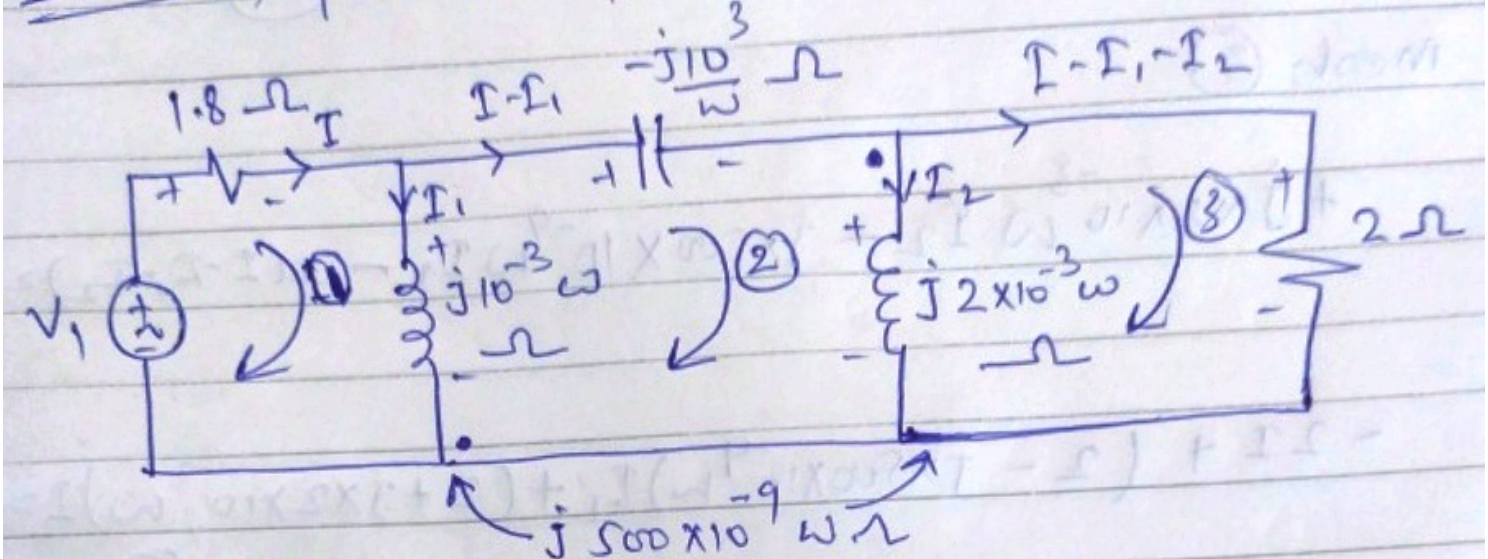
Soln 5

(a) phasor representation :-



(b) mesh (1)

m = opposite.

$$V_1 - 1.8I - j\,10^{-3}\omega I_1 + j\,500\times10^{-9}\omega I_2 = 0$$

$$1.8I + j\times10^{-3}\omega I_1 - j\,500\times10^{-9}\omega I_2 = V_1 \quad \text{— (1)}$$

Mesh (2)

$$+j\times10^{-3}\omega I_1 - \left(-\frac{j\times10^{3}}{\omega}\right)(I_2 - I_1) - j\,2\times10^{-3}\omega I_2 = 0$$

$$-j\times500\times10^{-9}\omega I_2 \qquad +j\times500\times10^{-9}\omega I_1$$

$$\frac{j\times10^{3}}{\omega} I + \left(j\times10^{-3}\omega - \frac{j\times10^{3}}{\omega} + j\times500\times10^{-9}\omega\right) I_1 + \left(-j\times2\times10^{-3}\omega\right)$$

$-j\times500\times10^{-9}\omega)I_2 = 0$ — (2)

Mesh (3)

$+j\times2\times10^{-3}\omega\, I_2 - j\times500\times10^{-9}\omega I_1 - 2(I-I_1-I_2)$

$-2I + (2 - j\times500\times10^{-9}\omega)I_1 + (2+j\times2\times10^{-3}\omega)I$

— (3)

(3) $V_1 = 8\angle0^\circ \quad \omega = 720$

Using Cramer Rule solve for I_2

$I_2 = 1.69 + j2.6 \ A$

(or) $3.14\angle57.3^\circ \ A.$

$i_2(t) = 3.14 \sin(720t + 57.3^\circ) A$

Tutorial 4

Soln 4. Loop 1 mesh eqn:-

$$+V_1 - 4700 I_1 - j2000 I_1 + j750 I_2 = 0$$

$$(-4700 - j2000) I_1 + j750 I_2 = -V_1$$

(OR)

$$(4700 + j2000) I_1 + j750 I_2 = V_1 \quad -(1)$$

Loop 2 mesh eqn:-

$$-j1800 I_2 - 500 I_2 + 870 I_2 = 0$$
$$- j750 I_1$$

$$-j750 I_1 + (870 - j1800) I_2 = 0 \quad -(2)$$

Solve using Crammer Rule:-

$$I_1 = 7.73 \angle -20.3^\circ \text{ mA}$$

$$I_2 = 2.54 \angle -163.2^\circ \text{ mA}$$

$$V_2 = 870 I_2 = 2.2 \angle -163.2^\circ \text{ V}$$

$$\frac{V_2}{V_1} = \frac{2.2 \angle -163.2^\circ}{40 \angle 0^\circ} = 0.055 \angle -163.2^\circ$$

$$\frac{I_2}{I_1} = 0.33 \angle -142.9^\circ$$