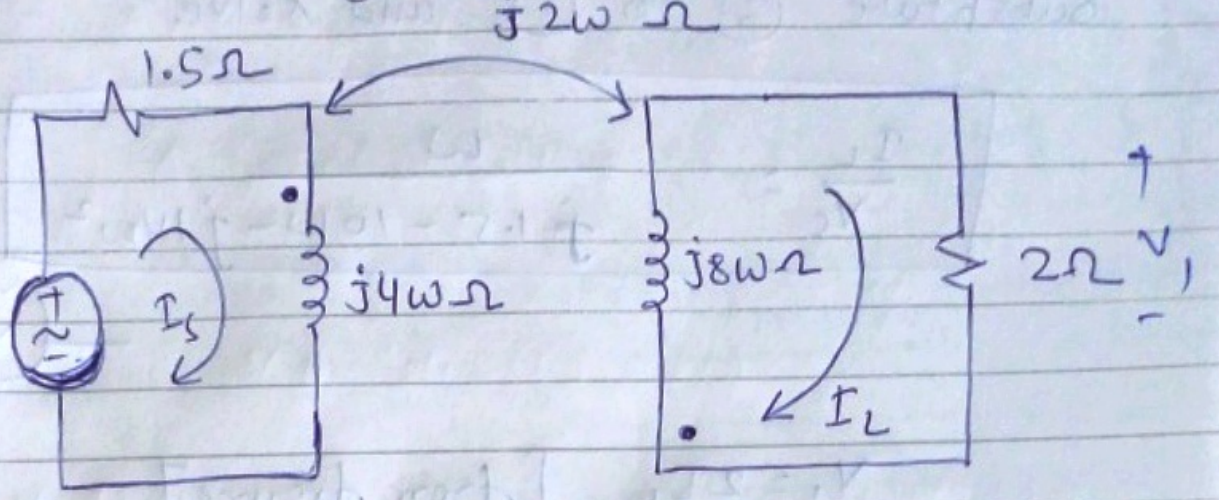
Tutorial 8

Q 4 Phasor form:-



M = Same.

Loop ①

$$V_s = 1.5 I_s + j4\omega I_s + j2\omega I_L$$

$$= I_s(1.5 + j\omega 4) + I_L(j2\omega) \quad -①$$

Loop ②

$$2I_L + j8\omega I_L + j2\omega I_s = 0 \quad -②$$

solve for I_s

$$I_s = \frac{-I_L(2 + j8\omega)}{j2\omega}$$

$$I_s = I_L \left(\frac{j}{\omega} - 4 \right) \quad \text{—(3)}$$

Substitute (3) in (1) and solve

$$\frac{I_L}{V_s} = \frac{\omega}{j1.5 - 10\omega - j14\omega^2} \quad \frac{A}{V}$$

—(4)

$V_1 = 2I_L$ [from figure]

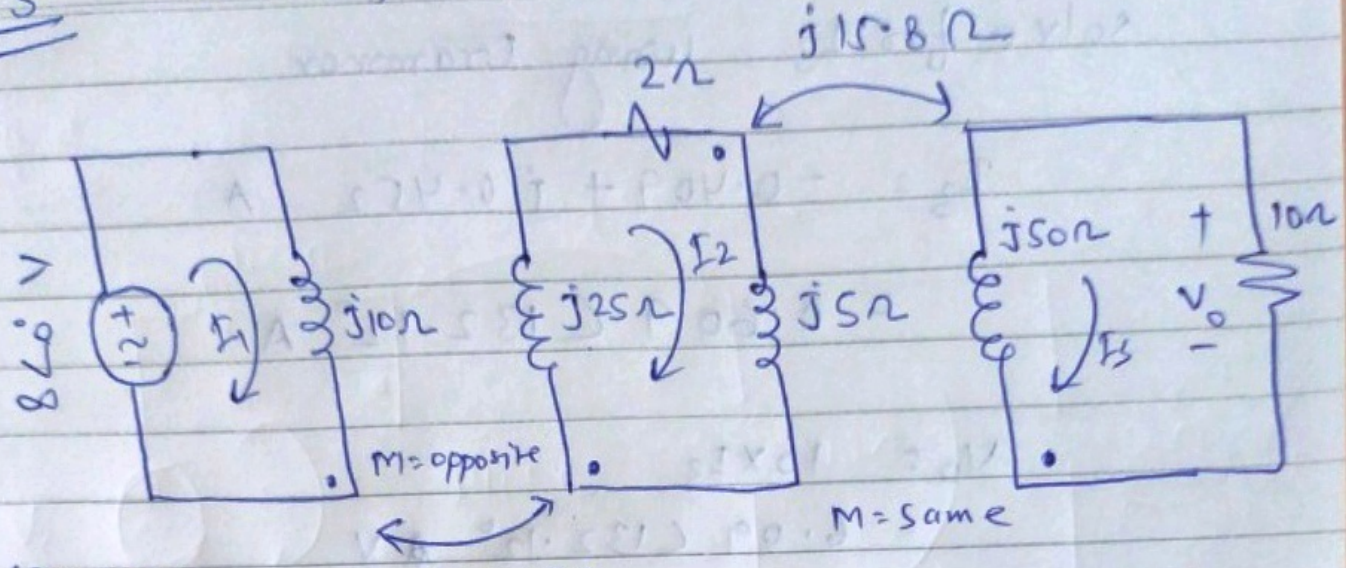
$I_1 = \frac{V_1}{2}$

put in eqn (4)

$$\frac{V_1}{V_s} = \frac{2\omega}{j1.5 - 10\omega - j14\omega^2} \quad \frac{A}{V}$$

Soln 5

Phasor form..



$V_o = 10 I_3$ — (1)

Loop (1)

$8\angle 0^\circ = j10 I_1 - j14.23 I_2$

$j10 I_1 - j14.23 I_2 - 0 I_3 = 8$ — (1)

Loop (2)

$I_1(-j14.23) + I_2(2+j30) + I_3(j15.8)$ — (2)

Loop (3) $0 \times I_1 + j15.8 I_2 + (10+j50) I_3$ — (3)

Solve for I_3 using Crammer

$$I_3 = -0.409 + j\,0.452 \quad A$$

$$= 0.609 \angle 132.12^\circ \quad A$$

$$V_0 = 10 \times I_3$$

$$= 6.09 \angle 132.12^\circ \quad V$$

$$v_0(t) = 6.09 \cos(1000t + 132.12^\circ) \quad V$$