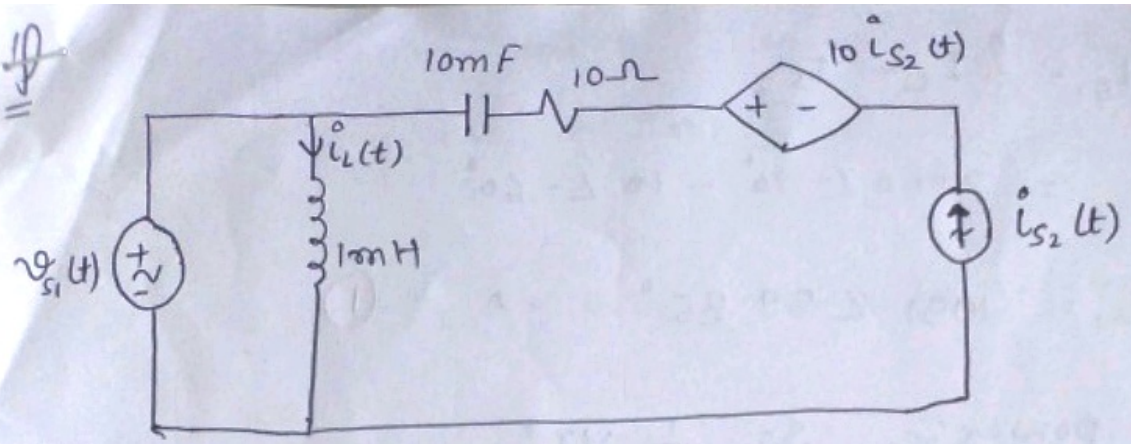
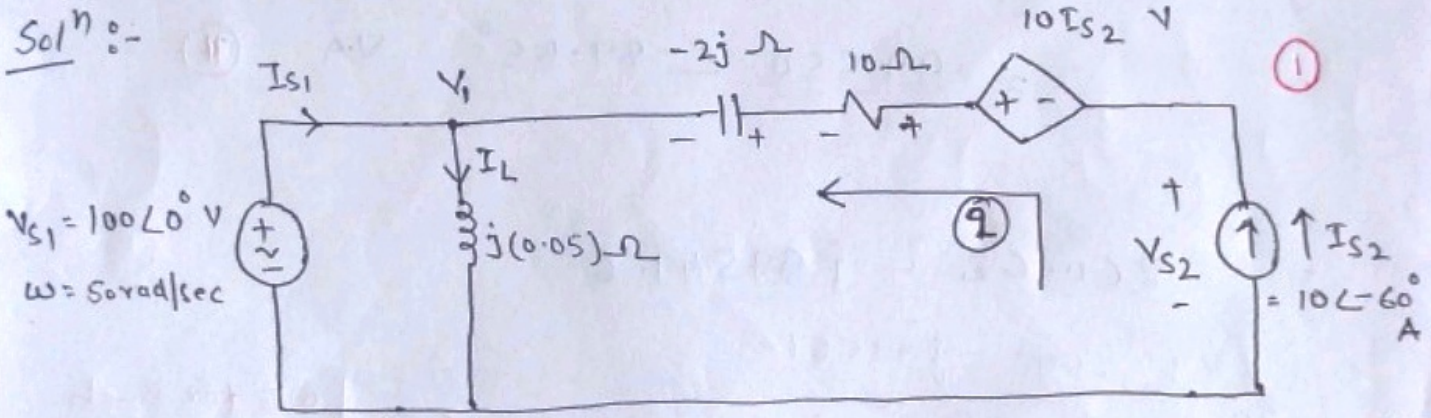


$v_{s_1}(t) = 100\cos(50t)$ V

$i_{s_2}(t) = 10\sin(50t + 30^\circ)$ A (OR) $10\cos(50t - 60^\circ)$ A

Soln :-



$V_1 = V_{s_1}$ [Voltage Across parallel Branch]

(a) Current through inductor :-

$$I_L = \frac{V_{s_1}}{j(0.05)} = \frac{100\angle 0^\circ}{j(0.05)}$$

$$I_L = 2000\angle -90^\circ \text{ A}$$

$$\Rightarrow i_L(t) = 2000\cos(50t - 90^\circ) \text{ A} \quad (1)$$

[0.5 : units, 0.5 : correct Am.]

$= 2000\sin(50t)$ A

(b) Power Calculation due to voltage source $v_{s_1}(t)$:-

by applying KCL at Node V_1 :

$$I_{s_1} + I_{s_2} = I_L$$

$$I_{S1} = I_L - I_{S2}$$

$$= 2000\angle -90^\circ - 10\angle -60^\circ$$

$$I_{S1} = 1991\angle 89.85^\circ \quad A \qquad (1)$$

Complex power :- $S = \frac{1}{2} V_{S1} I_{S1}^*$

$$= \frac{1}{2}(100\angle 0^\circ)(1991\angle -89.85^\circ)$$

$$= 99550\angle -89.85^\circ \quad VA \qquad (1)$$

$$= 260.62 - j\,99549.6$$

$$250 - j\,99567.$$

$\langle P_{avg} \rangle = 260.62$ watts. (1/2) [0.5 for each source]

$\langle$ Reactive Power $\rangle = -99549.6$ VAR (1/2)

(c) Power factor $= \cos(\theta - \phi)$

$= \cos(0 - 89.85^\circ)$

$= 0.002$ lagging $[\theta < \phi]$

(1)

Power Calculation due to current source I_{s2} :-

By Applying KVL in loop (2) :-

$$V_{s2} + 10 I_{s2} - 10 I_{s2} + 2j\, I_{s2} - 100\angle 0^\circ = 0$$

$$V_{s2} = 100\angle 0^\circ - 2j\, I_{s2}$$

$$= 100\angle 0^\circ - 2j\,(10\angle -60^\circ)$$

$$V_{s2} = 83.28 \angle -6.89^\circ \text{ volt} \quad (1)$$

Complex power :- $S = \frac{1}{2} V I^*$

$$= \frac{1}{2}(83.28\angle -6.89^\circ)(10\angle +60^\circ)$$

$$= 416.4 \angle 53.11 \text{ VA} \quad (1)$$

$$= 249.95 + j\,333.03$$

$\langle P_{avg} \rangle = 249.95$ Watts (1/2)

$P_{reactive} = 333.03$ VAR (1/2)

(c) Power factor $= \cos(\theta - \phi)$

$= \cos(-6.89 - (-60^\circ))$

$= 0.6$ leading $[\theta > \phi]$ (1)