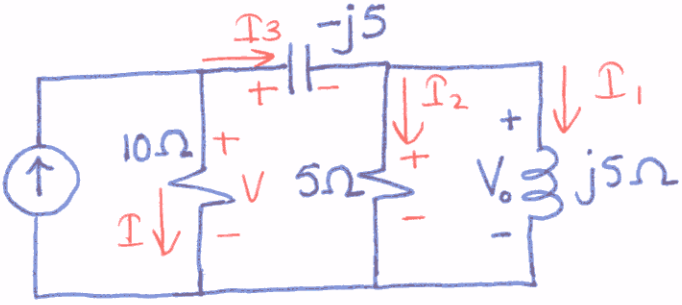
ID KEY

Name

Quiz#7
EE 201 (032)

If $V_o = 8\angle 30^\circ$ V in the circuit, find I_s.



$$I_1 = \frac{V_o}{j5} = \frac{8\angle 30^\circ}{5\angle 90^\circ} = 1.6\angle -60^\circ$$

$$I_2 = \frac{V_o}{5} = \frac{8\angle 30^\circ}{5} = 1.6\angle 30^\circ$$

$$I_3 = I_1 + I_2 = 1.6\angle -60^\circ + 1.6\angle 30^\circ$$

$$= 0.8 - j1.38 + 1.38 + j0.8 = 2.18 - j0.58$$

$$= 2.256\angle -14.9^\circ$$

Apply KVL in the middle loop

$$-V + (-j5)I_3 + 5I_2 = 0$$

$$\Rightarrow V = (5\angle -90^\circ)(2.256\angle -14.9^\circ) + 5(1.6\angle 30^\circ)$$

$$= 11.28\angle -104.9^\circ + 8\angle 30^\circ = -2.9 - j10.9 + 6.93 + j4$$

$$= 4 - j6.9 = 7.97\angle -59.89^\circ.$$

$$I = \frac{V}{10} = \frac{7.97\angle -59.89^\circ}{10} = 0.797\angle -59.89^\circ$$

$$I_s = I + I_3 = 0.797\angle -59.89^\circ + (2.256\angle -14.9^\circ)$$

$$= 0.4 - j0.689 + 2.18 - j0.58 = 2.58 - j1.269$$

$$\boxed{I_s = 2.875\angle -26.19^\circ}$$