

Name

OM SHIVASTAVA

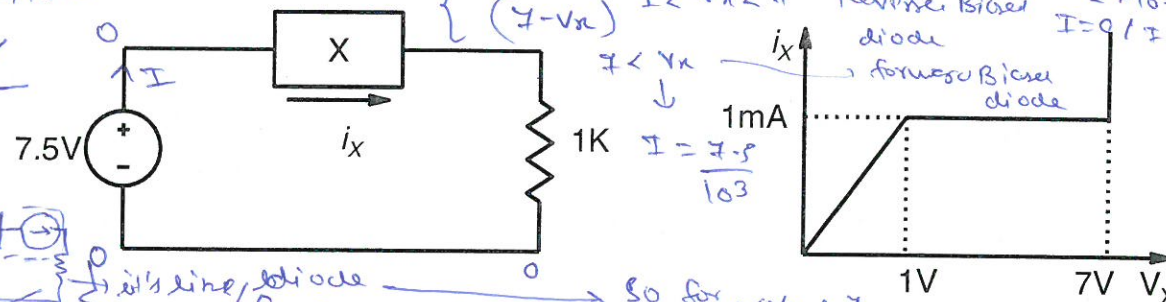
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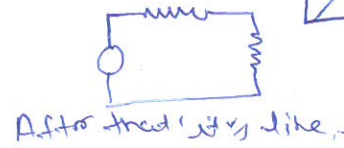
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1 (a). Determine the current flowing in the circuit assuming that the current-voltage characteristics of element X is as shown below on the right. [2]



Ans for $0 < V_x < 1$ it's like resistor

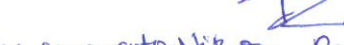


After find it's like



⇒

IV-characteristic of Resistor is



Since Both are in series

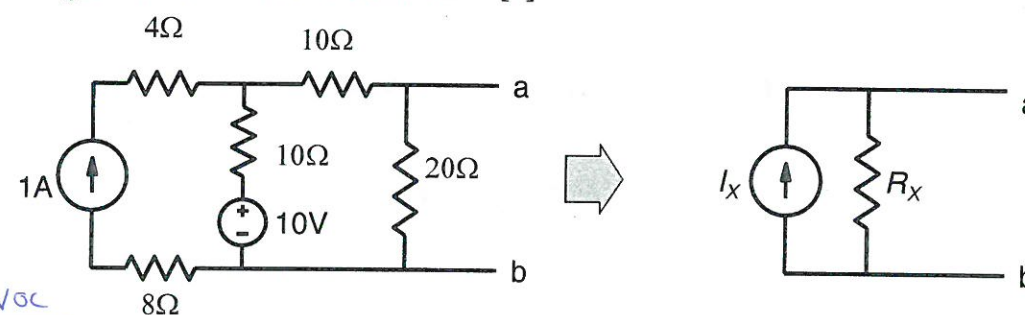


Voltage get added in series



⇒

1 (b). Using Source transformation only, show that the circuit below on the left can be transformed into the equivalent circuit shown on the right and determine I_x and R_x . [5]



⇒

Finding V_{oc}

By mesh analysis

$I_1 = 1A$

$$10 = 10(I_2 - I_1) + 10I_2 + 20I_2$$

$$\Rightarrow 40I_2 - 10I_1 = 10$$

$$4I_2 - I_1 = 1$$

$$I_2 = \frac{1}{2}$$

$$V_{oc} = 20 \times I_2$$

$$V_{oc} = 10$$



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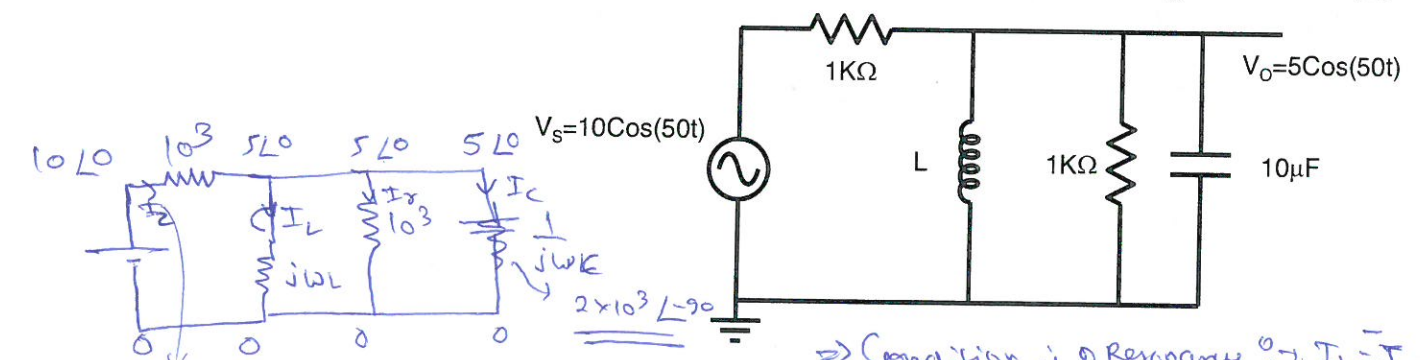
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2(a). For the circuit shown below, determine the value of inductor for the indicated voltages. [3]



Condition of Resonance $\Rightarrow I_L = I_C$

$$\frac{1}{j\omega L} = -j\omega C$$

$$\omega^2 = \frac{1}{LC}$$

$$L = \frac{1}{\omega^2 C}$$

$$L = \frac{1}{2500 \times 10^{-5}} = 4 \times 10^{-5} H$$

$$L = 40 \mu H$$

$$I_2 = I_L + I_R + I_C$$

$$I_2 = \frac{10\angle 0 - 5\angle 0}{10^3\angle 0} = \frac{5\angle 0}{10^3\angle 0} = \frac{5}{10^3}$$

$$I_C = \frac{5\angle 0}{2 \times 10^{-3}\angle -90} = \frac{5 \times 10^3\angle 90}{2}$$

$$I_R = \frac{5\angle 0}{10^3}$$

$$I_L = \frac{5\angle 0}{10^3\angle 90}$$

$$\left(\frac{5}{10^3} \angle -90 \right) + \frac{5 \times 10^3 \angle 90}{2} + \frac{5}{10^3} = \frac{5}{10^3}$$

$$\frac{5}{10^3} \angle -90 + \frac{5 \times 10^3 \angle 90}{2} = 0$$

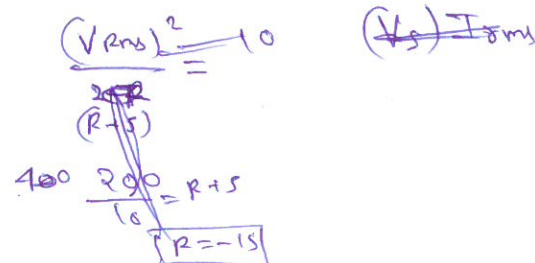
$$\frac{1}{50L} = \frac{10^3}{2}$$

$$L = \frac{2 \times 10^{-3}}{50} = 4 \times 10^{-5} H$$

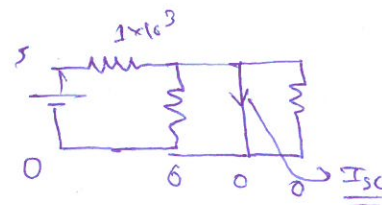
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5



$$R = \frac{2.5}{5 \times 10^{-3}} = \frac{10^3}{2} = 0.5 \text{ k}\Omega$$

$$\ln(10/6) = 7.83 \text{ uF}$$

Rough Work

find answer

$C = 7.834F$