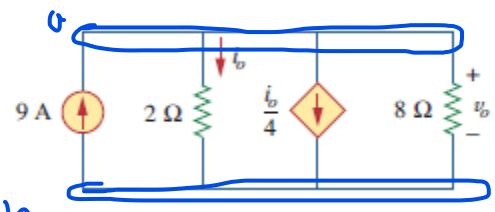
Step 1: Simplify the circuit
a. Narrow down the nodes.

Question 1

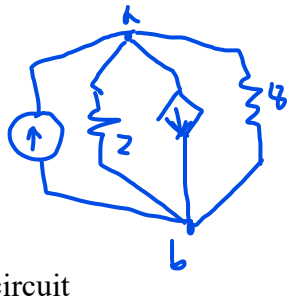
Find v_o and i_o in the circuit given below:



$9 - i_o - \frac{i_o}{4} - \frac{2i_o}{8} = 0 \quad \therefore i_o = 6A$

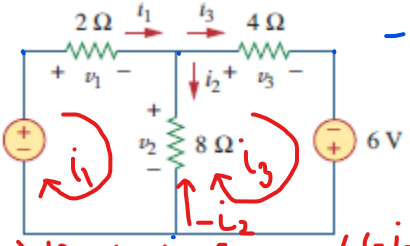
$v_o = 2i_o = 12V$

Simplify →



Question 2

Find the currents and voltages in the circuit shown in the following circuit



- Loop direction is taken opposite to i_2's direction $(-i_2)$
- $(-i_2)$ is hitting (−) terminal of 8 Ω. $(-(-i_2))$
- V_2 starts with (−). $(-(-(-i_2)))$.

$-10 + 2i_1 + 8i_2 = 0$

$4i_3 - 6 - 8(-(-i_2)) = 0$

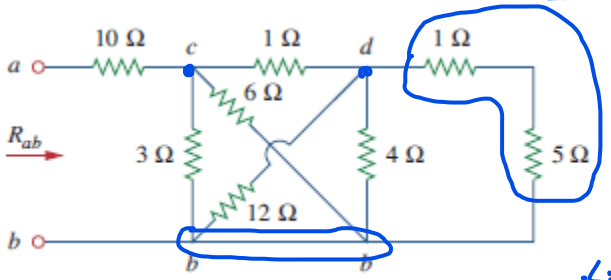
$i_1 - i_3 - i_2 = 0$

$i_1 = 3A$, $i_2 = 0.5A$, $i_3 = 2.5A$

$V_1 = 6V$, $V_2 = 4V$, $V_3 = 10V$

Question 3

Find R_{ab} for the circuit shown below:



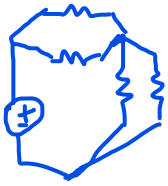
6Ω

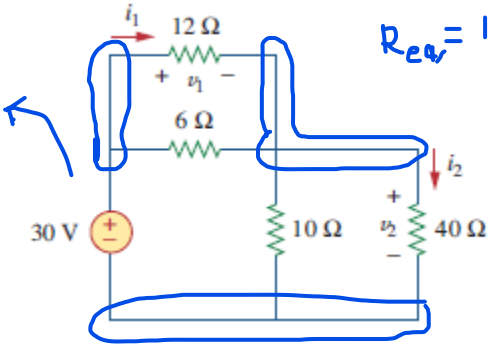
$R_{ab} = 11.2\ \Omega$

Simplify

Question 4

Find v_1 and v_2 in the circuit shown in following figure. Also calculate i_1 and i_2 and the power dissipated in the 12Ω and 40Ω resistors.





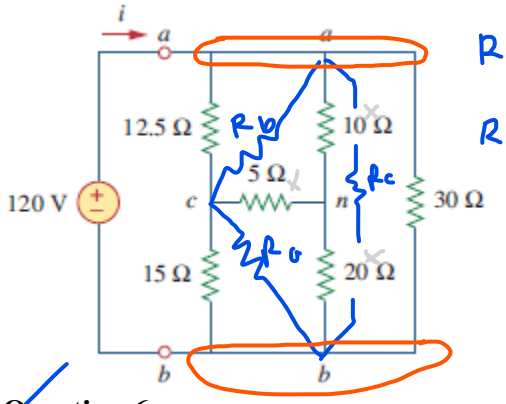
$R_{eq} = 12\ \Omega \quad \therefore I = \frac{30}{12} = 2.5A$

$\therefore i_1 = 2.5 \times \frac{6}{12+6} = 0.833A \; ; V_1 = 10V$

$i_2 = 2.5 \times \frac{10}{10+40} = 0.5A \; ; V_2 = 20V$

Question 5

Obtain the equivalent resistance R_{ab} for the circuit in following figure and use it to find current i.



$R_a = \frac{10\times20 + 10\times5 + 5\times20}{10} = 35\ \Omega$

$R_b = \frac{\cdots 350}{20} = 17.5\ \Omega$

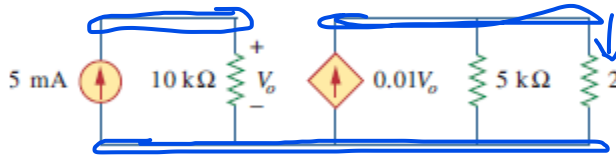
$R_c = \frac{350}{5} = 70\ \Omega$

$R_{ab} = 9.63\ \Omega$

$i = \frac{120}{9.63} = 12.45\ A$

Question 6

For the network in the given figure, find the current, voltage, and power associated with the 20-kΩ resistor.



$V_o = 10000 \times 5\times10^{-3} = 50\ V$

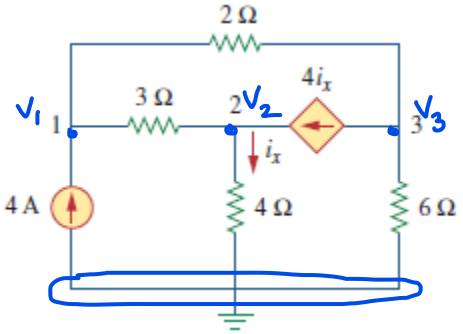
$I_o = 0.01 V_o = 0.5\ A$

$i = I_o \times \frac{5000}{5000 + 20000} = 0.1\ A$

V, P

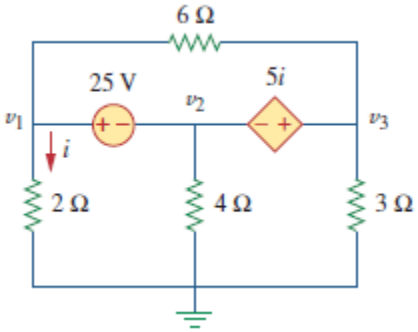
Question 7

Find the voltages at the three non-reference nodes in the circuit below.



Question 8

Find v_1, v_2 and v_3 in the circuit of following figure using nodal analysis.



Question 9

For the circuit in the given circuit, find $i1$ to $i4$ using mesh analysis.