

Quiz 4 Solution

Electrical Circuits 1

TE1002

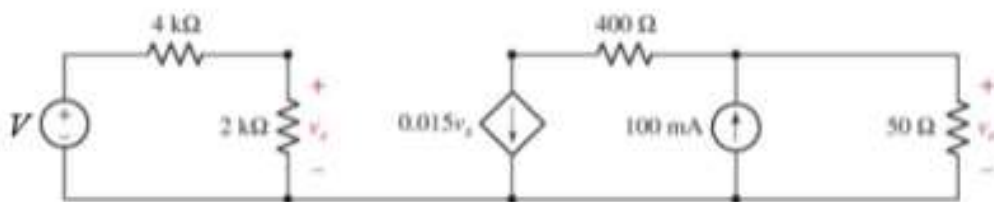
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Name _____

1)

Consider the circuit given below.



If $V = 11$ V, determine the value of v_o .

The value of v_o is V.

Explanation:

Let us define the reference as the bottom node of the circuit. Notice that we essentially have two “parts” of the circuit.

The left part of the circuit is a voltage divider, where we see that

$$v_x = 11 \text{ V} \frac{2k}{2k+4k} = 3.6667 \text{ V}$$

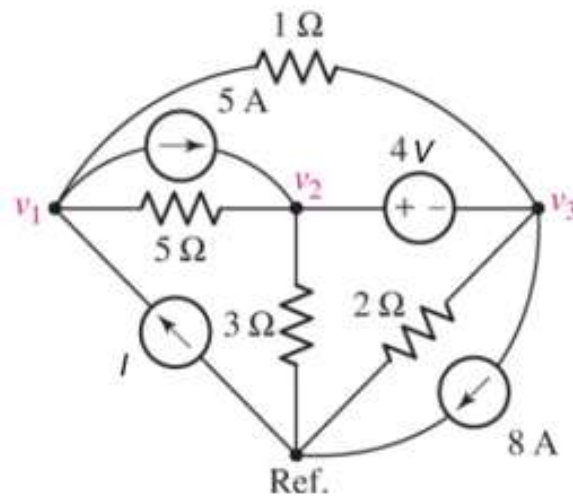
This value is then used to define the dependent source. We can then perform nodal analysis by writing a KCL equation at node v_o .

$$\frac{v_o}{50} = 0.1 - 0.015 (3.6667)$$

$$v_o = 2.25 \text{ V}$$

2)

Consider the circuit given below.



If $I = 7\text{ A}$, determine the nodal voltages using the supernode technique.

The value of the voltage (v_1) = V.

The value of the voltage (v_2) = V.

The value of the voltage (v_3) = V.

Explanation:

We first create a supernode from nodes 2 and 3.

The nodal equations are

$$7 - 5 = \frac{v_1 - v_2}{1} + \frac{v_1 - v_2}{5}$$

$$5 - 8 = \frac{v_2}{3} + \frac{v_2 - v_1}{5} + \frac{v_2}{2} + \frac{v_2 - v_1}{1}$$

We also require a KVL equation that relates the two nodes involved in the supernode:

$$v_2 - v_3 = 4\text{ V}$$

On solving the simultaneous equations, we get

$$v_1 = -0.4667\text{ V}$$

$$v_2 = 1.2\text{ V}$$

$$v_3 = -2.8\text{ V}$$