Princess Sumaya University for Technology
جامعة الأميرة سمية للتكنولوجيا

King Abdullah II School of Engineering

EE21221
Electric Circuits (1)
Section #4

Quiz #3
Tuesday 30/11/2021

Name: ……

Q.1) Calculate i_1 and i_3 if i_2=1.5 A in the circuit shown in Figure Q.1. [4-Points]

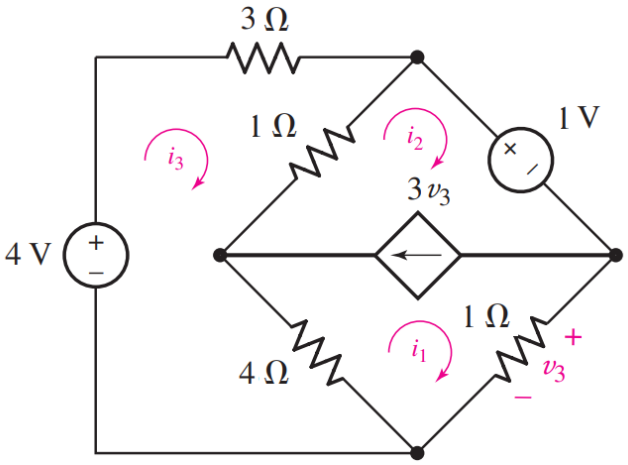


Figure Q.1

Solution:

i_1= **i_3=**

Solution :

$i_2 - i_1 = 3v_3 \rightarrow v_3 = i_1 * (1)$

$i_2 - 4i_1 = 0 \ldots\ldots\ldots\ldots (1)$

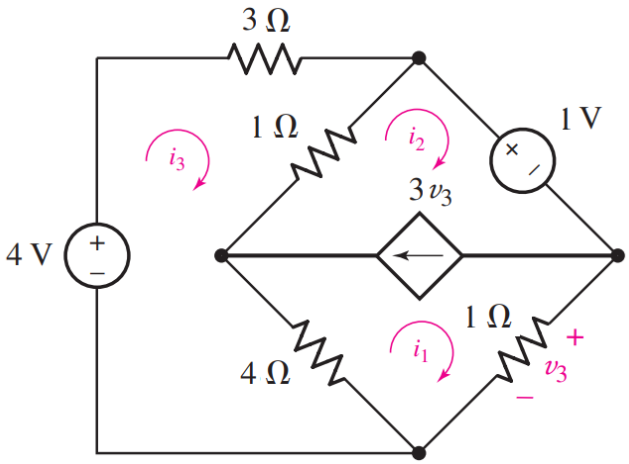
mesh $i_3 \rightarrow \quad -4 + 3 * i_3 + 1 * (i_3 - i_2) + 4 * (i_3 - i_1) = 0 \ldots\ldots\ldots\ldots (2)$

i_1 & $i_2 \rightarrow \quad 1 + i_1 * (1) + 4 * (i_1 - i_3) + (i_2 - i_3) * 1 = 0 \ldots\ldots\ldots\ldots (3)$

$i_1 = 0.375\ A$

$i_2 = 1.5\ A$

$i_3 = 0.875\ A$



Q.2) Find v_1, v_2, and i in the circuit shown in Figure Q.2. [6-Points]

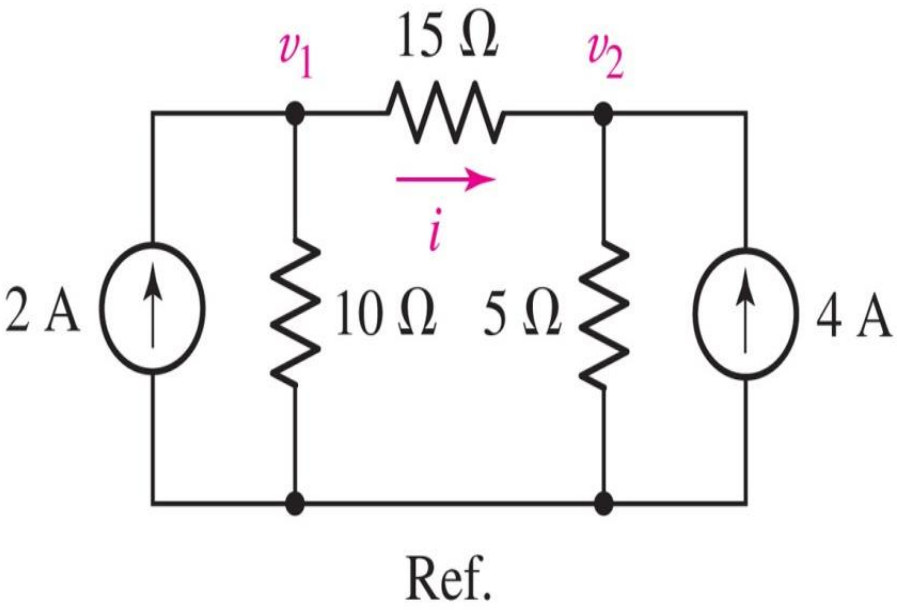


Figure Q.2

Solution:

v_1= **v_2=** **i=**

EXAMPLE 4.1

Nodal analysis will directly yield numerical values for the nodal voltages v_1 and v_2, and the desired current is given by $i = (v_1 - v_2)/15$.

Before launching into nodal analysis, however, we first note that no details regarding either the 7 Ω resistor or the 3 Ω resistor are of interest. Thus, we may replace their series combination with a 10 Ω resistor as in Fig. 4.2*b*. The result is a reduction in the number of equations to solve.

Writing an appropriate KCL equation for node 1,

$$2 = \frac{v_1}{10} + \frac{v_1 - v_2}{15} \qquad [5]$$

and for node 2,

$$4 = \frac{v_2}{5} + \frac{v_2 - v_1}{15} \qquad [6]$$

Rearranging, we obtain

$$5v_1 - 2v_2 = 60$$

and

$$-v_1 + 4v_2 = 60$$

Solving, we find that $v_1 = 20$ V and $v_2 = 20$ V so that $v_1 - v_2 = 0$. In other words, ***zero current*** is flowing through the 15 Ω resistor in this circuit!