Princess Sumaya University for Technology
جامعة الأميرة سمية للتكنولوجيا

King Abdullah II School of Engineering

EE21221
Electric Circuits (1)
Section #1

Quiz #3
Tuesday 30/11/2021

Name: ……..

Q.1) Calculate the four mesh currents in the circuit shown in Figure Q.1. [4-Points]

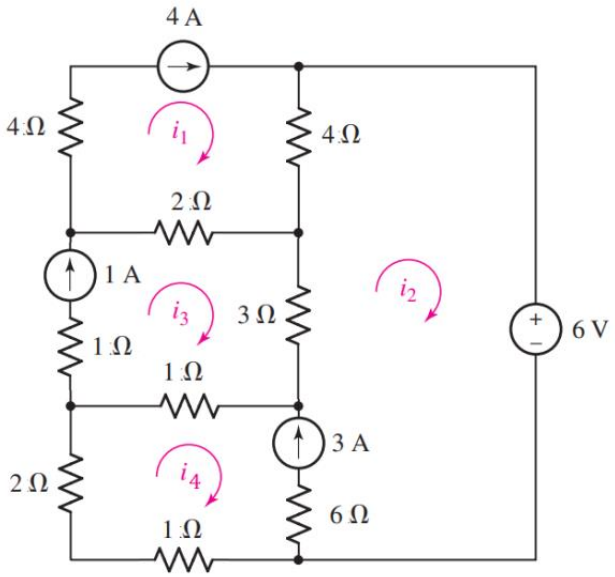


Figure Q.1

Solution:

i_1= i_2= i_3= i_4=

Solution :

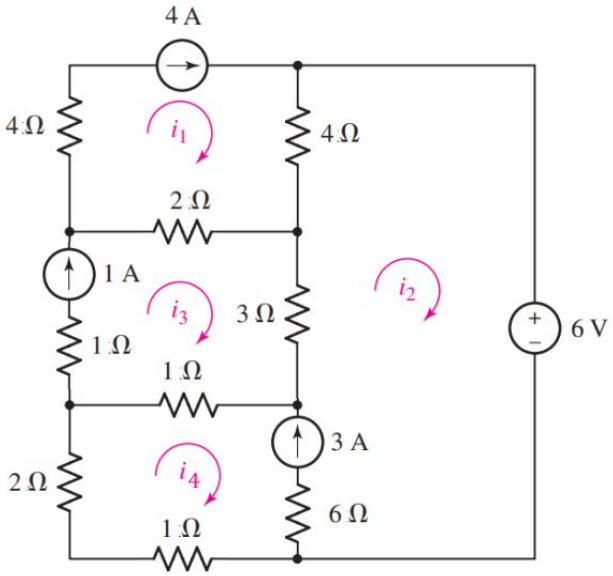
$i_1 = 4\ A$

$i_3 = 1\ A$

$i_2 - i_4 = 3\ A$

$i_{2\ mesh} \rightarrow 6 + i_4(3) + (i_4 - i_3)(1) + (i_2 - i_3)(3) + (i_2 - i_1)(4) = 0$

$i_1 = 4\ A, i_2 = 2.36\ A, i_3 = 1\ A, i_4 = -0.636\ A$



Q.2) Find v_1, v_2, and i_1 in the circuit shown in Figure Q.2. [6-Points]

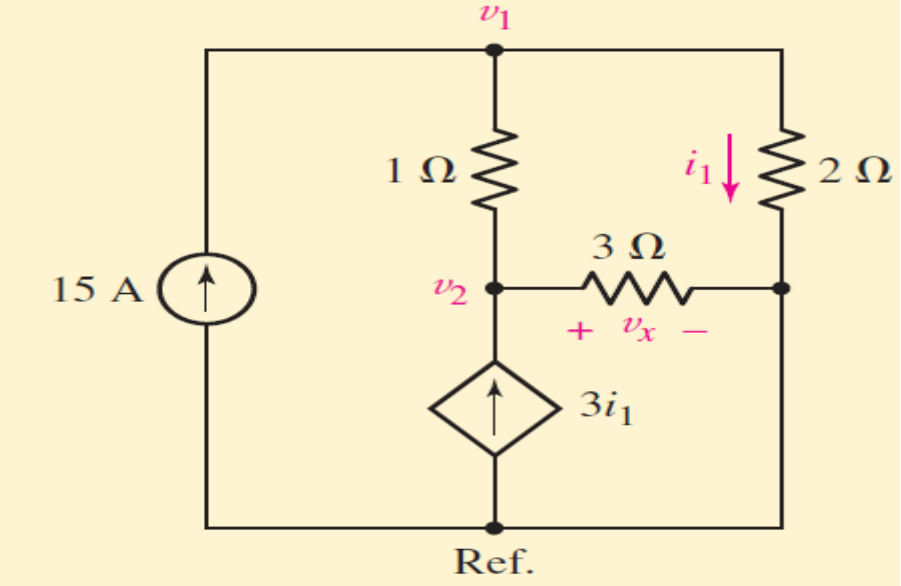


Figure Q.2

Solution:

v_1= **v_2=** **i_1=**

EXAMPLE 4.3

We choose the bottom node as our reference, since it has a large number of branch connections, and proceed to label the nodal voltages v_1 and v_2 as shown in Fig. 4.6*b*. The quantity labeled v_x is actually equal to v_2.

At node 1, we write

$$15 = \frac{v_1 - v_2}{1} + \frac{v_1}{2} \qquad [10]$$

and at node 2

$$3i_1 = \frac{v_2 - v_1}{1} + \frac{v_2}{3} \qquad [11]$$

Unfortunately, we have only two equations but three unknowns; *this is a direct result of the presence of the dependent current source, since it is not controlled by a nodal voltage*. Thus, we need an additional equation that relates i_1 to one or more nodal voltages.

In this case, we find that

$$i_1 = \frac{v_1}{2} \qquad [12]$$

which upon substitution into Eq. [11] yields (with a little rearranging)

$$3v_1 - 2v_2 = 30 \qquad [13]$$

and Eq. [10] simplifies to

$$-15v_1 + 8v_2 = 0 \qquad [14]$$

Solving, we find that $v_1 = -40$ V, $v_2 = -75$ V, and $i_1 = 0.5v_1 = -20$ A. Thus, the power supplied by the dependent source is equal to $(3i_1)(v_2) = (-60)(-75) = 4.5$ kW.