King Abdullah II School of Engineering

EE21221
Electric Circuits (1)
Section #3

Quiz #3
Tuesday 1/12/2021

Name: ………………………………………………………………..

Q.1) Calculate i_1 and i_3 if i_2=2.5 A in the circuit shown in Figure Q.1. [4-Points]
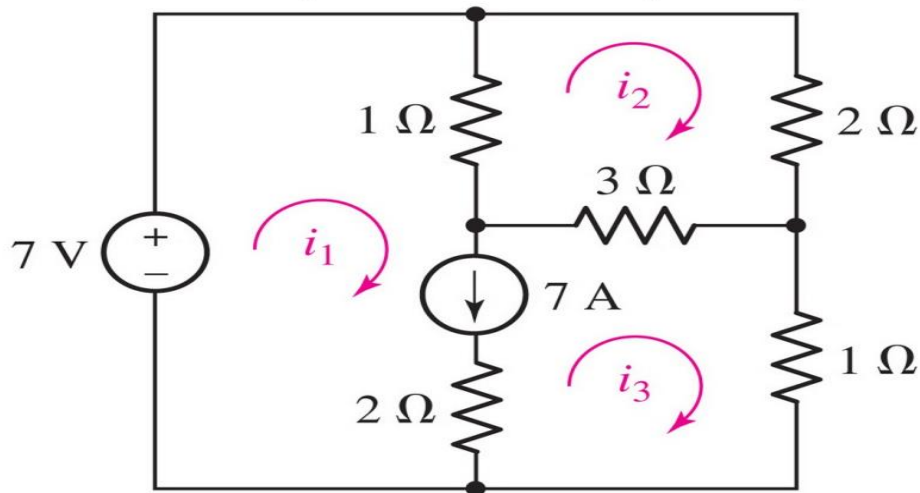
Figure Q.1

Solution:

$i_1=$ $i_3=$

We note that a 7 A independent current source is in the common boundary of two meshes, which leads us to create a supermesh whose interior is that of meshes 1 and 3 as shown in Fig. 4.24b. Applying KVL about this loop,

$$-7 + 1(i_1 - i_2) + 3(i_3 - i_2) + 1i_3 = 0$$

or

$$i_1 - 4i_2 + 4i_3 = 7 \qquad [32]$$

and around mesh 2,
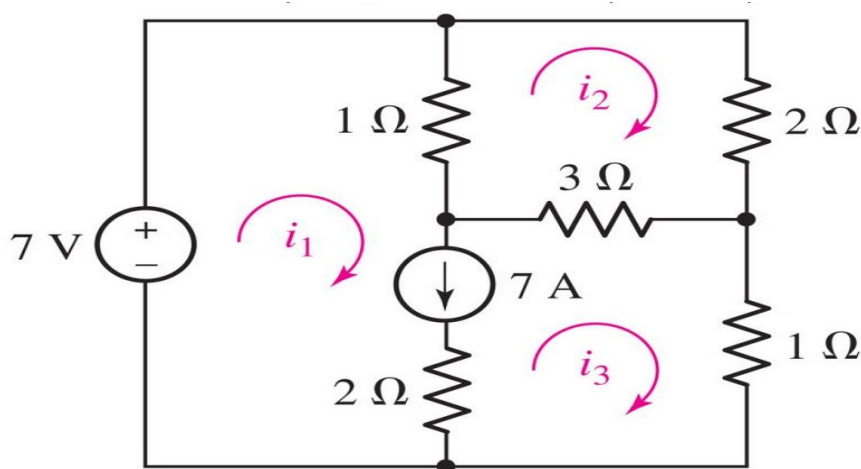
$$1(i_2 - i_1) + 2i_2 + 3(i_2 - i_3) = 0$$

or

$$-i_1 + 6i_2 - 3i_3 = 0 \qquad [33]$$

Finally, the independent source current is related to the mesh currents,

$$i_1 - i_3 = 7 \qquad [34]$$

Solving Eqs. [32] through [34], we find $i_1 = 9$ A, $i_2 = 2.5$ A, and $i_3 = 2$ A.

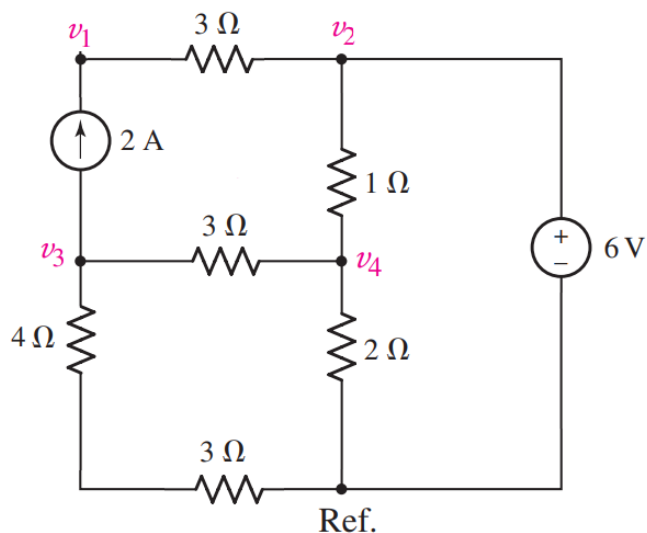**Q.2) Find all four nodal voltages in the circuit shown in Figure Q.2. [6-Points]**

Figure Q.2

Solution:

V₁=☐   V₂=☐   V₃=☐   V₄=☐

Solution: Section 1 Q.2 HW#2

$v_2 = 6\ V$ ... ... ①

At node $v_1 \rightarrow$ $\frac{v_1 - v_2}{3} = 2$ ... ... ②

At node $v_3 \rightarrow$ $\frac{v_3}{7} + \frac{v_3 - v_4}{3} = -2$ ... ... ③

At node $v_4 \rightarrow$ $\frac{v_4}{2} + \frac{v_4 - v_2}{1} + \frac{v_4 - v_3}{3} = 0$ ... ... ④

$v_1 = 12\ V$

$v_2 = 6\ V$

$v_3 = -2.19\ V$

$v_4 = 2.9\,V$