University of Jordan

Department of Electrical Engineering

Circuits I, EE-211

Fall 2012

First Exam

Time : 60 Min.

Date: Oct. 18, 2012

13.5

Name (Arabic): [illegible] Student # : 0119203 Section # : 1 Dr. Iyad

Show all steps of your calculations

Problem # 1(5 pts)

For the circuit shown in Figure 1, obtain the followings:

1- Find the current i_x.
2- Find the voltage V_{CD}.
3- Determine the **supplied** power for the 0.5Vy voltage source.
4- Find the voltage V_{BC}.

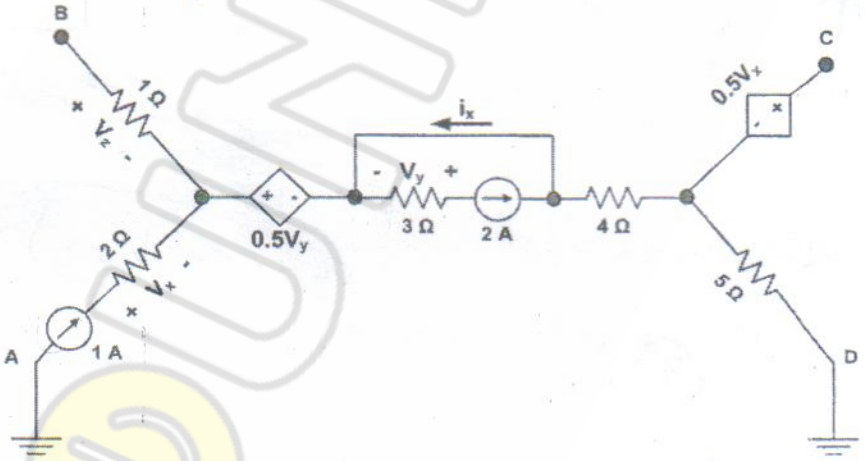


Figure 1.

V_{CD} =

$V_z + 0.5V_x + i\,5\Omega + V_D =$

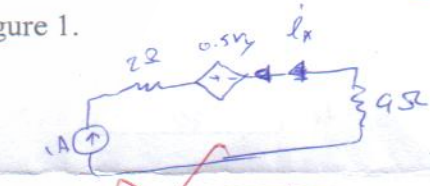
$V_{CD} = 0.5V_x + i \times 5$

$V_{CD} = 1 + -5$

$= -4V$

$V_x = iR$

$= 2V$



$i_x = -1$

(3) $V_y = 2IR = 6V$

$0.5V_y = -3V$

$i = i_x = -1A$

$P = -1(+3) = -3W$

$V_{BC} = 1i + 0.5V_y + 4i_x - 0.5V_x$

$= 3 + -4 - 0.5 + 1$

$= 0.5V$

(4)

$i_x =$ [-1], $V_{CD} =$ [-4], $P_{0.5Vy} =$ [-3 W], $V_{BC} =$ [0.5 V]

Problem # 2(6 pts)

A- For the circuit shown in Figure 2a, using **voltage division**, obtain the followings:

1- Find V_1
2- Find V_2
3- Find i_x

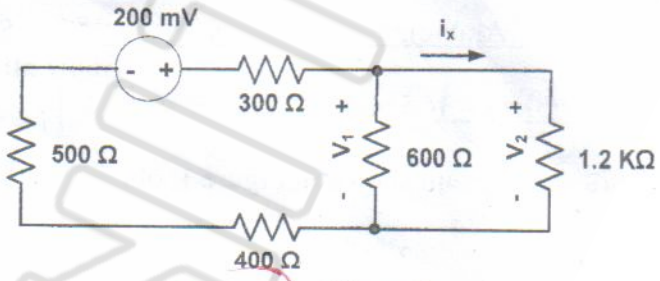


Figure 2a.

i_x = [41.7 μA], V_1 = [50 mV], V_2 = [50 mV]

B- For the circuit shown in Figure 2b, using **current division**, obtain the followings:

1- Find V_1
2- Find V_2

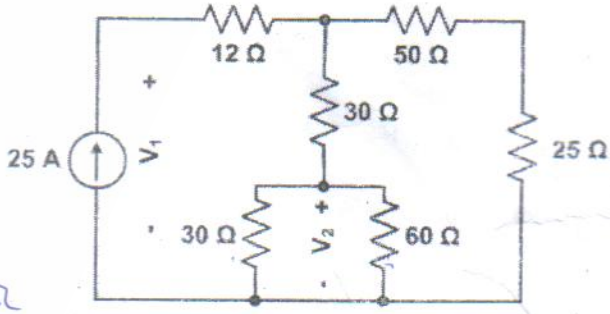


Figure 2b.

V_1 = [600 V], V_2 = [300 V]

n # 3(5 pts)

3

r the circuit shown in Figure 3, using **Nodal** analysis, determine the power generated by the 12A current source.

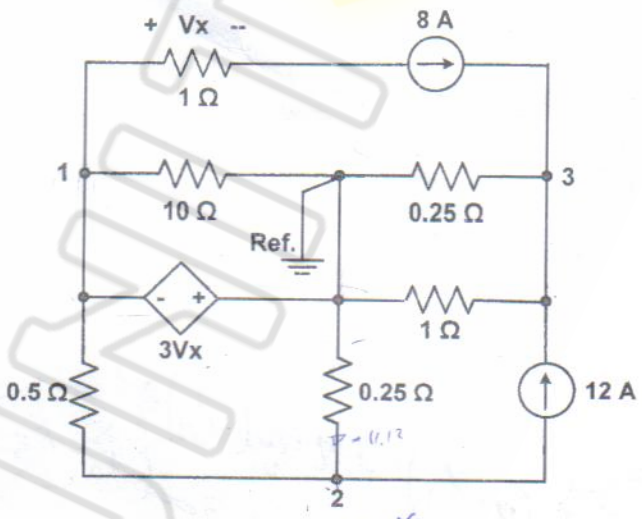


Figure 3

Node 1

supernode

$8 + \frac{v_1 - v_2}{0.5} + \frac{v_1}{10} + v_1 + 3v_x = 0$

$8 + \frac{v_1 - v_2}{0.5} + \frac{v_1}{10} + v_1 + 3v_x = 0$

$8 + 3v_1 - 2v_2 + \frac{1}{10}v_1 + 3v_x = 0$

$\frac{31}{10}v_1 - 2v_2 + 3v_x + 8 = 0$ — (1)

$v_1 - v_3$

$v_x = \frac{v_1 - v_3}{1}$

Node 2

$2(v_2 - v_1) + 4(v_2) + 12 = 0$

$2v_2 - 2v_1 + 4v_2 + 12 = 0$ — (2)

Node 3

$8 + 12 = 4v_3 + \frac{v_2}{2}$ — (3)

$5v_3 = 20 + v_2$ — (3)

$5v_3 = 20$

$v_3 = 4V$

$v_1 = 2.33$

$v_2 = 2.78$

$v_3 = -4$

$V_{12A} = v_2 - v_3 = 6.78$

$P_{12A} = IV$

$= 12 * 6.78$

$= 81.36$

$P_{12A} =$ 81.36

Problem # 4(4 pts) (4)

For the circuit shown in Figure 4, write the mesh equations in terms of I_1, I_2, and I_3.

Mesh 3

$-24 + 120(I_3 - I_1) + 200(I_3 - I_2) = 0$

$-120 I_1 - 300 I_2 + 450 I_3 = 24$

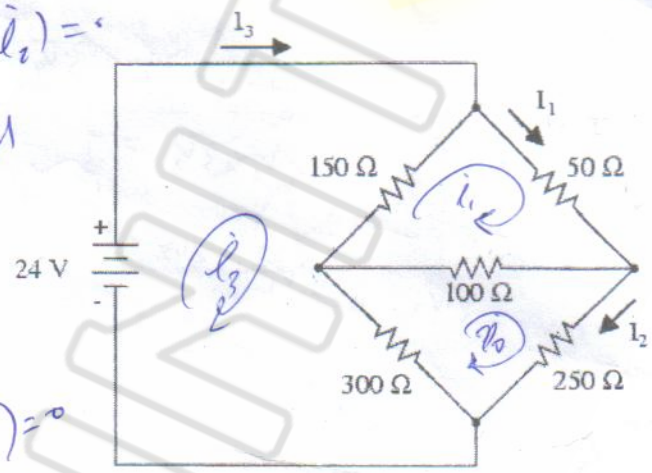


Figure 4

Mesh 2

$100(I_2 - I_1) + 250(I_2) + 300(I_2 - I_3) = 0$

$-100 I_1 + 650 I_2 - 300 I_3 = 0$

Mesh 1

$300 I_1 - 100 I_2 - 150 I_3 = 0$

300	I_1 +	−100	I_2 +	−150	I_3 =	0	✓
−100	I_1 +	650	I_2 +	−300	I_3 =	0	✓
−120	I_1 +	−300	I_2 +	+450	I_3 =	24	✓