Course Title: Electrical Circuits I	Exam: First Exam	Date: Oct/27/2015
Course No.: 0903211	Semester: 1st Term 2016-2017	Time Period: 1:00 Hr.
Instructor: Dr. Ahmad Atieh & Dr. Sahban Alnaser		

Q.1	Q.2	Q.3	Total /20
5	8	4	17/20

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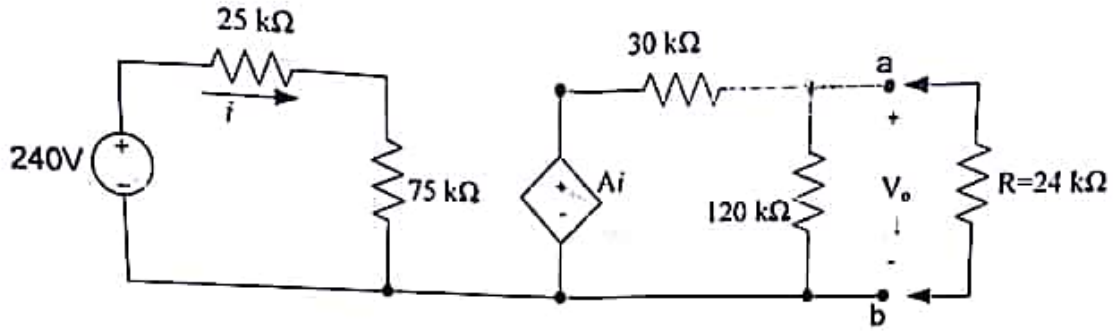
Student No.: 0156389
Section No.: 2

Q1.	ANSWER
1	ⓐ ⓑ ⓒ ⓓ ⓔ
2	ⓐ ⓑ ⓒ ⓓ ⓔ
3	ⓐ ⓑ ⓒ ⓓ ⓔ
4	ⓐ ⓑ ⓒ ⓓ ⓔ
5	ⓐ ⓑ ⓒ ⓓ ⓔ

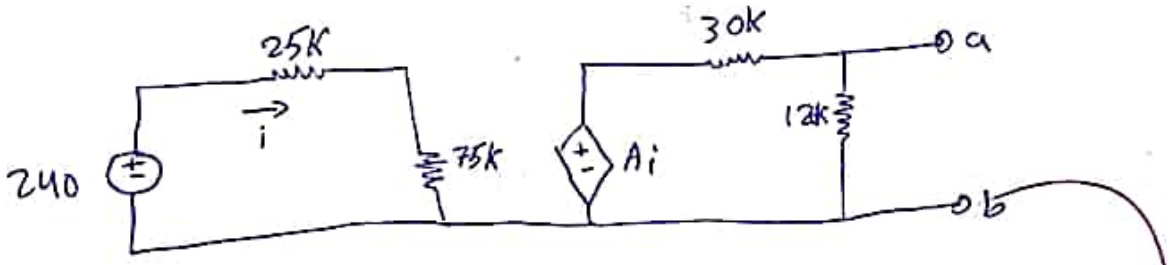
Q1) (5 Marks)

Assume that R absorbs maximum power of 216 mW from the rest of the circuit, find the constant A?



$$P_{max} = \frac{V_{th}^2}{4R_{th}} \rightarrow V_{th}^2 = 20736 \rightarrow V_{th} = 144\ V$$

V_{th} → open circuit



$$-240 + 25ki + 75ki = 0$$

$$100ki = 240 \rightarrow i = \boxed{2.4\ mA}$$

$5/7$

* $V_{th} = V_{120k\Omega}$

$$144 = 120k\, i_2 \rightarrow i_2 = \boxed{1.2\ mA}$$

$$-Ai + 30k\, i_2 + 120k\, i_2 = 0$$

$$-2.4mA + 30k(1.2m) + 120k(1.2m) = 0$$

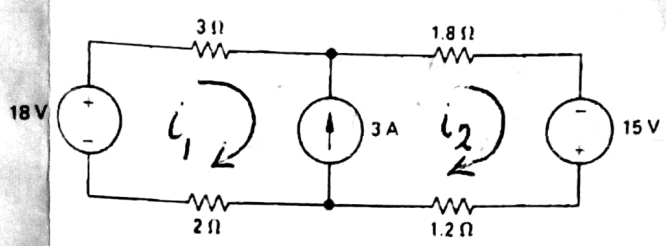
$$36 + 144 = 2.4mA.$$

$$A = \frac{180}{2.4 \cdot 10^{-3}} = \boxed{75k}$$

Q2) (10 Marks)

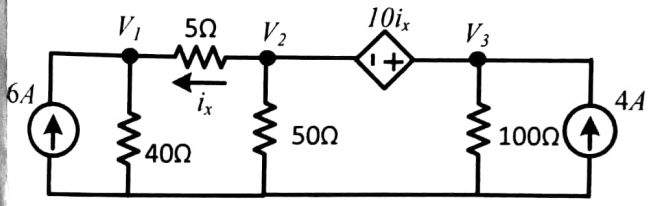
1) For the circuit shown below, the super mesh equation can be written as:

a. $4.2i_1 + 4i_2 = 15$
b. $5.1i_1 + 4i_2 = 18$
c. $5i_1 + 3i_2 = 33$
d. $5i_1 + 4i_2 = 3$
e. $5i_1 - 4i_2 = -33$



2) The super-node equation in the circuit shown below can be written as:

a) $20V_1 + 12V_2 + 3V_3 = 400$
b) $-20V_1 + 22V_2 + V_3 = 400$
c) $2.2V_1 + 6V_2 + 8V_3 = -40$
d) $-20V_1 + 12V_2 + 5V_3 = 25$
e) is not listed



***Answer questions (3-5)* for the circuit shown below:**

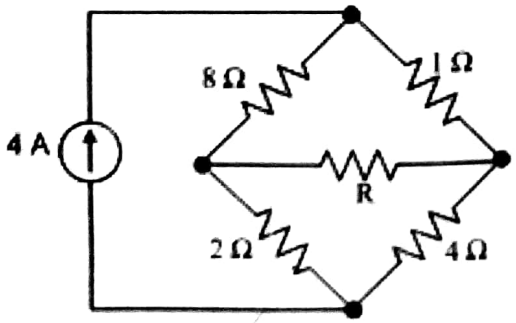
If you know that R absorbs maximum power from the rest of the circuit, then:

3) The value of R in Ohms is:

(a) 2.4 (b) 3.6
(c) 3.33 (d) 1.6
(e) None of these

4) The maximum power is:

(a) 6.67 W (b) 17.77 W (c) 4.44 W (d) 53.33 W
(e) None of these

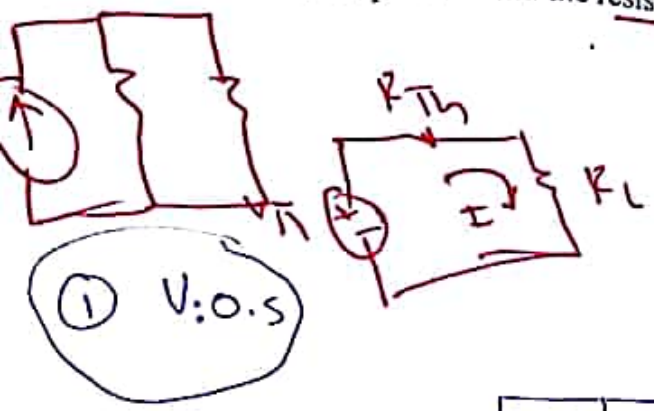


5) If we replace the current source with voltage source with 4V and adjusted R again to absorbs maximum power, then R in Ohms is:

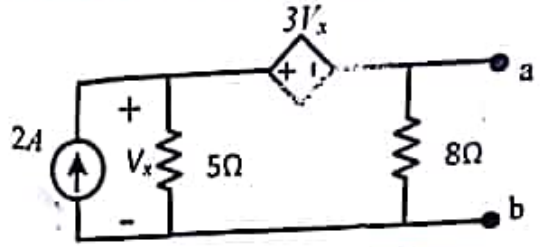
(a) 2.4 (b) 3.6
(c) 3.33 (d) 1.6
(e) None of these

Q3) (5 Marks)

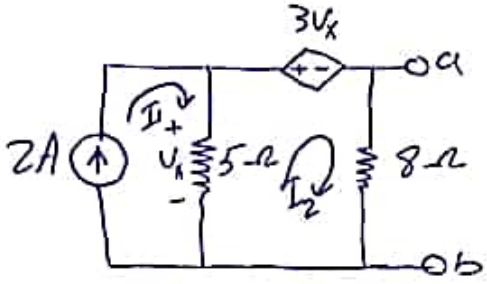
In the circuit shown below, a load is connected between terminals a and b consumes maximum power. Find the resistance of this load and the current that is flowing in it?



① V: 0.5



4/5 ✓



* $I_1 = 2A$

* $5I_2 - 10 + 3V_x + 8I_2 = 0$

$5I_2 - 10 + 3(10 - 5I_2) + 8I_2 = 0$

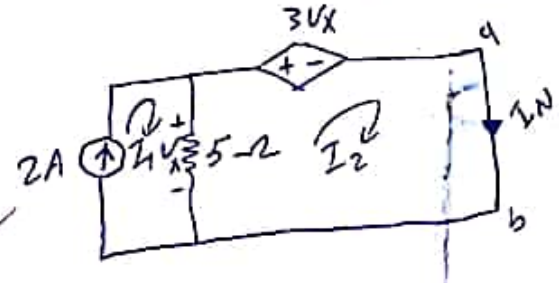
$13I_2 - 10 + 30 - 15I_2 = 0$

$-2I_2 = -20 \rightarrow I_2 = 10A$

$V_x = (I_1 - I_2)5$
$= 10 - 5I_2$

$V_{th} = V_{8\Omega} = I_2 \cdot 8\Omega$
$= 10 \cdot 8 = 80\ V$

② I: s.c



* $I_1 = 2A$

* $5I_2 - 10 + 3(10 - 5I_2) = 0$

$5I_2 + 20 - 15I_2 = 0$

$-10I_2 = -20$

$I_2 = 2A = I_N$

* $R_{Th} = \frac{V_{th}}{I_N}$

$R_{Th} = \frac{80}{2}$

$R_{Th} = 40\ \Omega$