بسم الله الرحمن الرحيم

8.5/10

*The University of Jordan*
*Department of Electrical Engineering*
*Circuit I, EE-211*
*Fall 2014*
*First Exam*

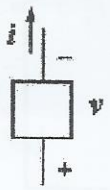
*Time: 60 Min.* *Date: Oct. 23,2014*

8-9:30 ش

*Name (Arabic):* [redacted] *Student #:* [redacted] *Section #:* م. رقم الجلوس

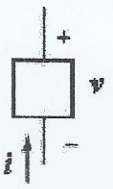
***Problem #1*** *(1 pt)*
*Find the absorbed power for each element of the following:* $P = IV$, $I^2R$, $\frac{V^2}{R}$

1. $i$=3 A and $v$=8V




$P = IV$
$= 3 \times 8$
$= 24\,W$

2. $i$=3 A and $v$= -8V




(1)

$P = IV$
$= (-3)(-8)$
$= 24\,W$

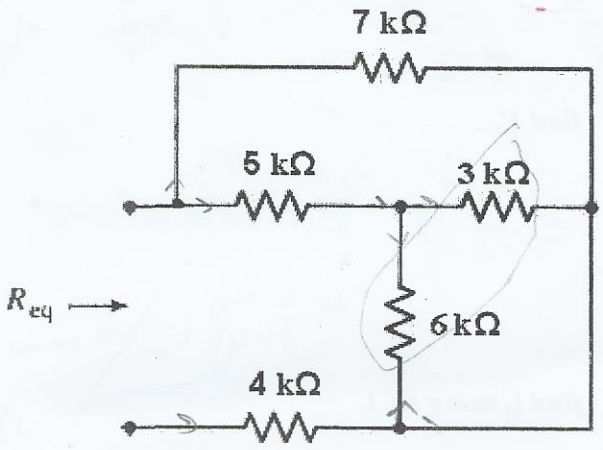
***Problem #2*** *(1.5 pts)*
*Find $R_{eq}$ of the following connection:*

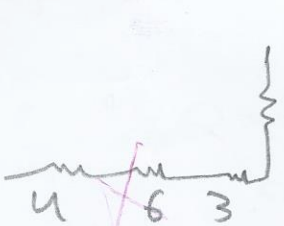
~~(3//6)~~

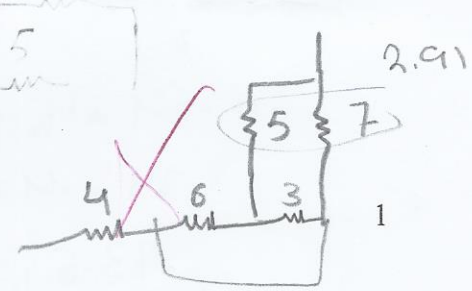
$5//7 = 2.91\,\Omega$

series

$2.9 + 3 + 6 + 4 = 15.9\,\Omega$



$V = IR$

$\frac{4}{4} = I$

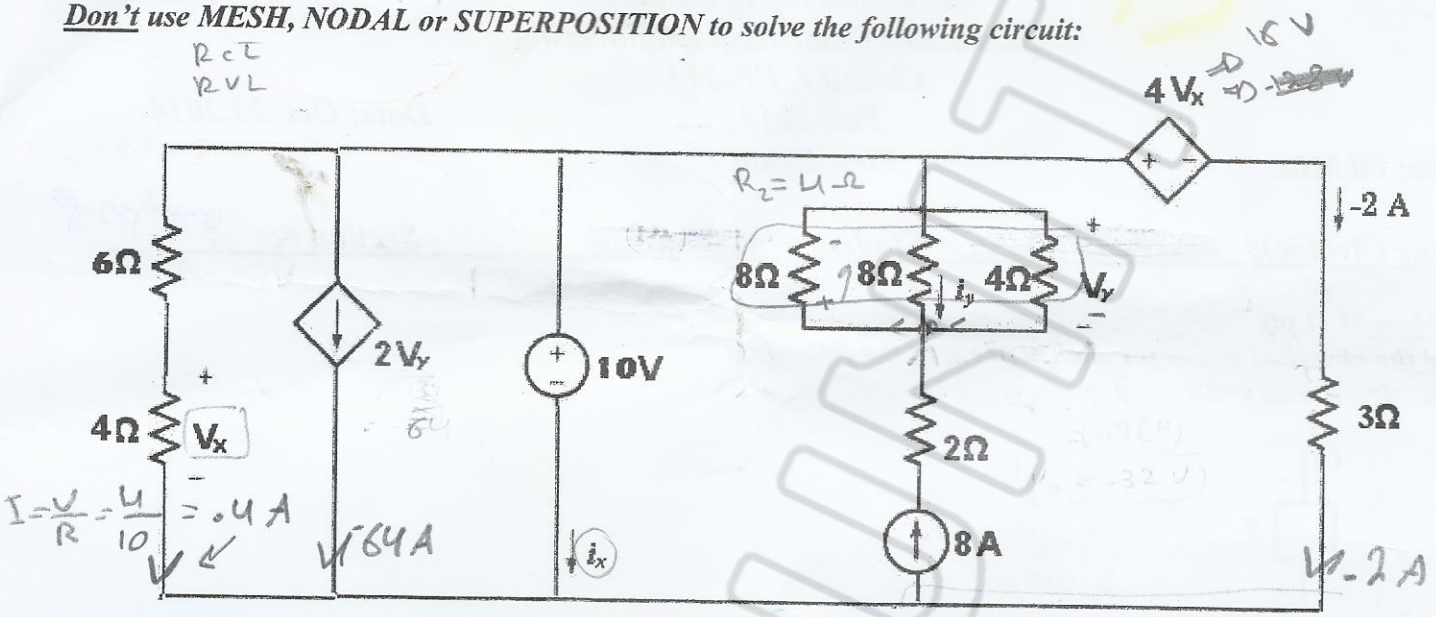
$I = 1A$

1.5

$V = IR$

***Problem #3*** *(4.5 pts)*

***Don't*** *use MESH, NODAL or SUPERPOSITION to solve the following circuit:*




1. *find $V_x$ by voltage division rule only.*

$V = V_T \frac{R}{R_1 + R_2 + \cdots}$

$V = 10 \frac{4}{10} = 4V$

2. *find $i_y$ by current division rule only.*

$I_y = I_T \frac{\frac{1}{R_y}}{\frac{1}{R} + \frac{1}{R_2}}$

$= 8 \frac{\frac{1}{8}}{\frac{1}{8} + \frac{1}{8} + \frac{1}{4}} = 8 \times \frac{\frac{1}{8}}{4} = .25A$

3. *find $V_y$*

$V_y = IR$

$= .2$

$R_8 // R_8 // R_4$

$\frac{8}{2} + \frac{1}{4} = 4\Omega$

same voltage

$V = IR_4$

$= -8(4) = -32V$

4. *find $i_x$ using KCL.*

$2V_x + I_x$

$64$

$8$

$2$

$74$

$.4 - 64 + i_x - 8 - 2 = 0$

$-74 + .4 + i_x = 0$

$-73.6 + I_x = 0$

$i_x = 73.6A$

$V = IR$

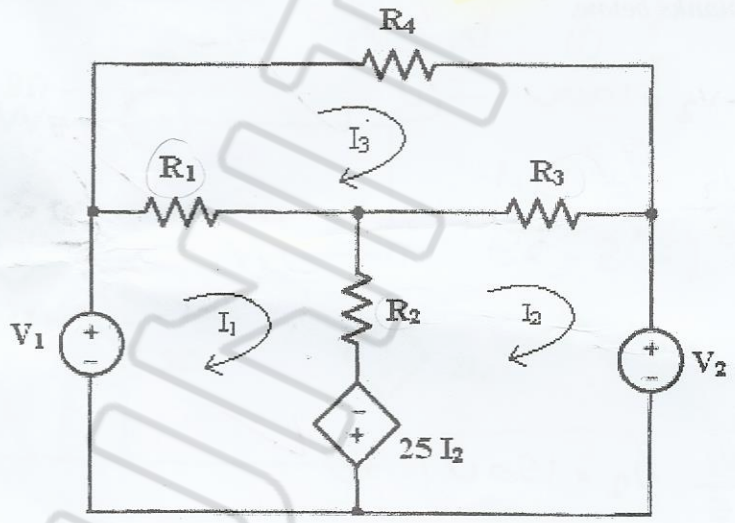
***Problem #4** (4 pts)*
***The Mesh Equations of the following Circuit are given by:***

$20\ I_1 - 40\ I_2 - 5\ I_3 = V_1$

$-15\ I_1 + 65\ I_2 - 25\ I_3 = -V_2$

$-5\ I_1 - 25\ I_2 + 35\ I_3 = 0$

**Find $R_1$, $R_2$, $R_3$ and $R_4$.**




$I_1 = .03571$
$I_2 = -7.14$
$I_3 = 0$

$R_1 =$

$V = R_1(I_1 - I_3)$

① → $-V_1 + R_1(I_1 - I_3) + R_2(I_1 - I_2) - 25I_2 = 0$

$R_1(I_1 - I_3) + R_2(I_1 - I_2) - 25I_2 = V_1$

$R_1(.03571) + R_2(7.18 + 178.5 = V_1$

③ → $R_1(I_3 - I_1) + R_4 I_3 + R_3(I_3 - I_2) = 0$

② → $25\ I_2 + R_2(I_2 - I_1) + R_3(I_2 - I_3) + V_2 = 0$

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$V_1 = 286.3142\ V$

$V_2 = 464.8\ V$

$R_1 = \frac{286.3142}{I_1 - I_3} = \frac{286.314}{.03571} = 8017.8\ \Omega$

$R_2 =$

$R_3 = \frac{V_2}{I_2 - I_3} = \frac{464.8}{-7.14} = 65.09\ \Omega$

$R_4 =$

(5)

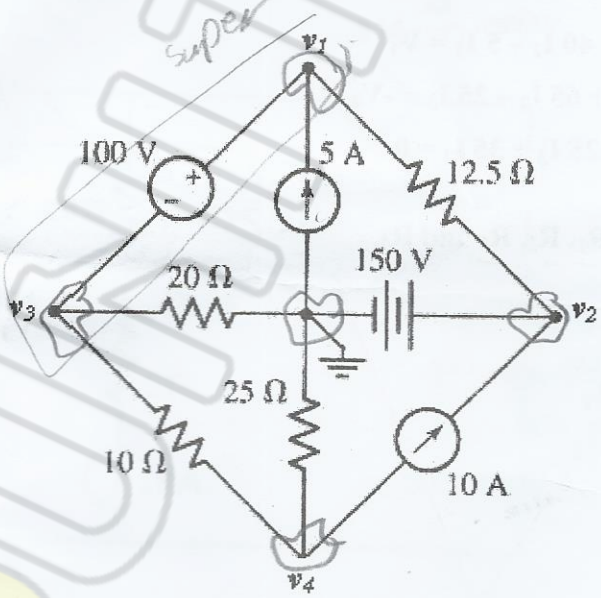
***Problem #5 (5 pts)***

***Write the NODAL voltage equations for the following circuit (Don't solve them; just arrange them to fill the blanks below.***

$v_1$ & $v_3$ super

$v_1 - v_3 = 100$ V — (1)

$\frac{v_1 - v_2}{12.5} - 5 + \frac{v_3}{20} + \frac{v_3 - v_4}{10} = 0$ — (2)




$v_2$

$v_2 = 150$ V (3)

$v_4$

$\frac{v_4 - v_3}{10} + \frac{v_4}{25} + 10 = 0$ — (4)

$v_1 - v_3 = 100$

$\frac{v_1 - v_2}{12.5} + \frac{v_3}{20} + \frac{v_3 - v_4}{10} = 5$

$v_2 = 150$

$\frac{v_4 - v_3}{10} + \frac{v_4}{25} = -10$

$\frac{v_1}{12.5} - \frac{v_2}{12.5} + \frac{v_3}{20} + \frac{v_3}{10} - \frac{v_4}{10} = 5$

$.4v_1 - .4v_2 + .15v_3 - .1v_4 = 5$ — (1)

$\frac{v_4}{10} - \frac{v_3}{10} + \frac{v_4}{25} = -10$ — (4)

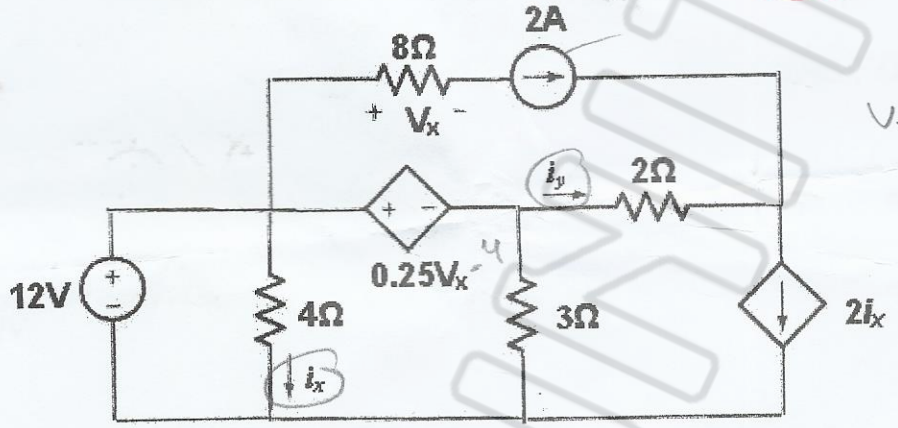
$.14v_4 - .1v_3 = -10$ (4)

$v_1 - v_2 = 100$ (1)

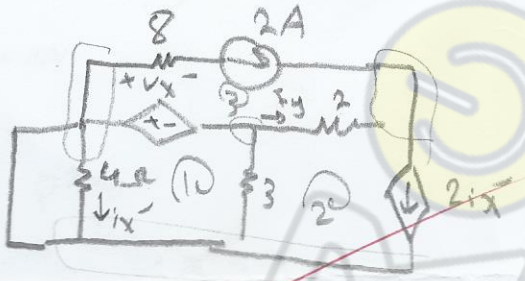
$v_2 = 150$ (2)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $v_1$ + | | $v_2$ + | | $v_3$ + | | $v_4$ = | |
| | $v_1$ + | | $v_2$ + | | $v_3$ + | | $v_4$ = | |
| | $v_1$ + | | $v_2$ + | | $v_3$ + | | $v_4$ = | |
| | $v_1$ + | | $v_2$ + | | $v_3$ + | | $v_4$ = | |

***Problem #6** (4 pts)*
***Use Superposition** Principle to find $i_x$ and $i_y$ in the following circuit.*




due to 2A




due to 12V [$v_x = 0$