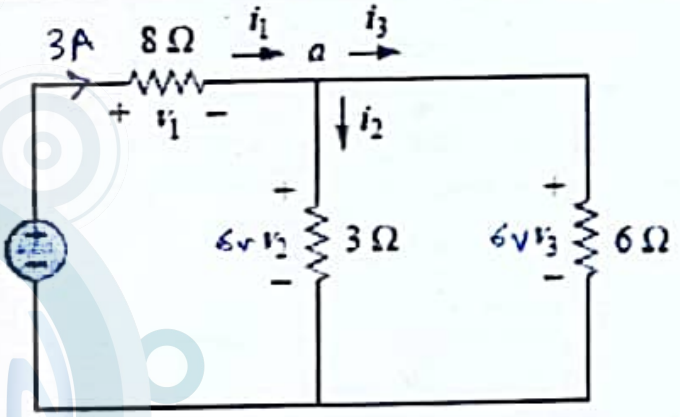
Dr. Nabeel Tawalbeh

Question #	Q1 (8)	Q2 (3)	Q3 (5)	Q4 (8)	Q5 (6)	Q6 (8)	Q7 (5)	Q8 (7)
Grade:	6	2	5	8	2	8	5	5

Question # 1 (8 points) **Show Your Calculations**

For the circuit shown below, use voltage and current dividers to calculate

a.	the voltage v_1.	$v_1 =$	24 v	V
b.	the voltage v_2.	$v_2 =$	6 v	V
c.	the voltage v_3.	$V_3 =$	6 v	V
d.	the current i_1.	$i_1 =$	3A	A
e.	the current i_2.	$i_2 =$	2A	A
f.	the current i_3.	$i_3 =$	1A	A



V = IR

$I_{total} = 3$

$V_1 = 24$ V

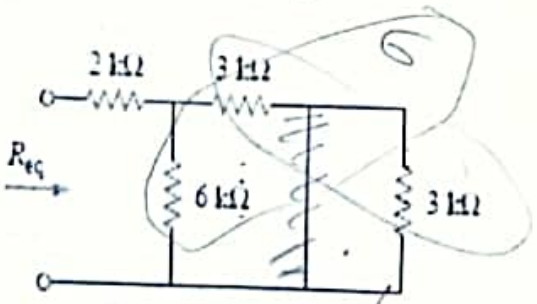
$V_3 = V_2 = 6$ V

$i_2 = 2A$, $i_3 = 1A$

Question 2 (3 points) **Show Your Calculations**

Find R_{eq} for the circuit shown below.

R_{eq} =	5	kΩ



Series $3+3=6\,k\Omega$

Parallel $\frac{1}{6}+\frac{1}{6}=3\,k\Omega$

Series $3+2=5\,k\Omega$

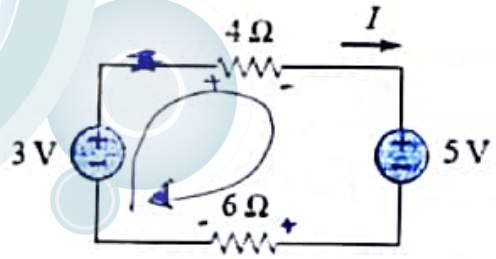
Question 3 (5 points) **Show Your Calculations**

For the circuit shown below, find

a.	the current I.	I =	-0.2 A			A
b.	the power absorbed by the 4-Ω resistor.	$P_{4\Omega}$ =	0.16	absorbed		W
c.	the power absorbed by the 6-Ω resistor.	$P_{6\Omega}$ =	0.24	absorbed		W
d.	the power generated or absorbed by the 3-V voltage source.	P_{3V} =	0.6	absorbed	generated	W
e.	the power generated or absorbed by the 5-V voltage source.	P_{5V} =	-1	absorbed	generated	W

(a) $-3 + 4I + 5V + 6I = 0$

$I = -0.2$ A



(b) $P_{4\Omega} = IV = I^2R = (-0.2)^2 4$

$= 0.16$ watt

(c) $P_{6\Omega} = I^2R = (-0.2)^2(6) = 0.24$ watt

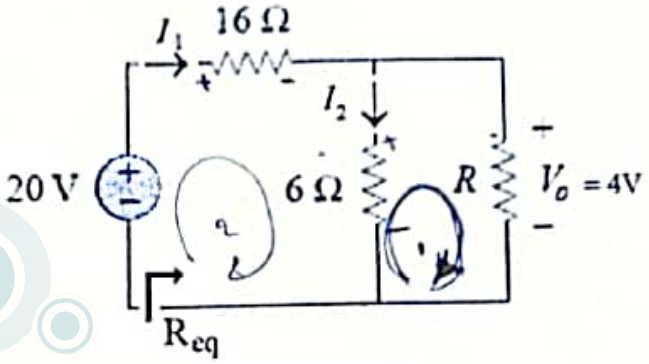
(d) $P_{3V} = IV = -(-0.2)\,3 = 0.6$ watt

(e) $P_{5V} = IV = -0.2 \times 5 = -1$ watt

Question 4 (8 points) **Show Your Calculations**

For the circuit shown below, the voltage across the resistance R is $V_o = 4V$, find

a.	the current I_1 supplied by the 20-V voltage source,	$I_1 =$	1 A ✓	A
b.	the current I_2 flowing through the 6-Ω resistor,	$I_2 =$	0.667 A	
c.	the resistance R.	$R =$	12 Ω ✓	Ω
d.	the equivalent resistance seen by the voltage source.	$R_{eq} =$	20 Ω	Ω



loop (1)

$-I_2 \times 6 + 4 = 0$

$+I_2 \times 6 = +4$

$I_2 = 0.667$

loop (2)

$-20 + I_1 \times 16 + 4 = 0$

$I_1 = 1A$

$R = \frac{V}{I} = \frac{4}{0.333} \simeq 12\Omega$

parallel $R_{eq} = \frac{1}{12} + \frac{1}{6} = \frac{1}{4} = 4\Omega$

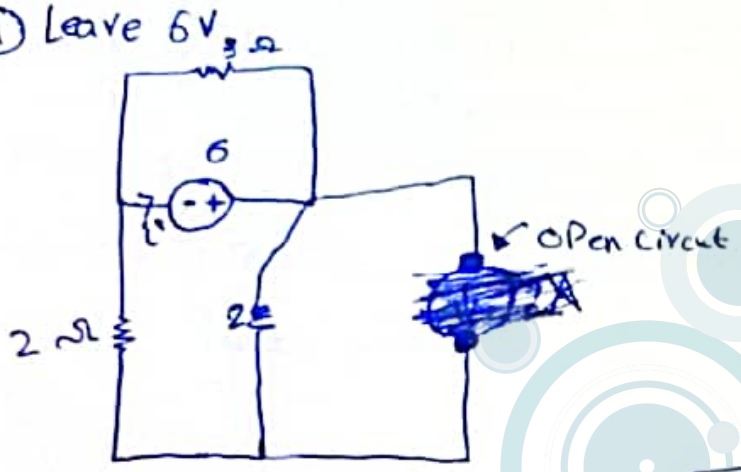
series $4 + 16 = 20\Omega$

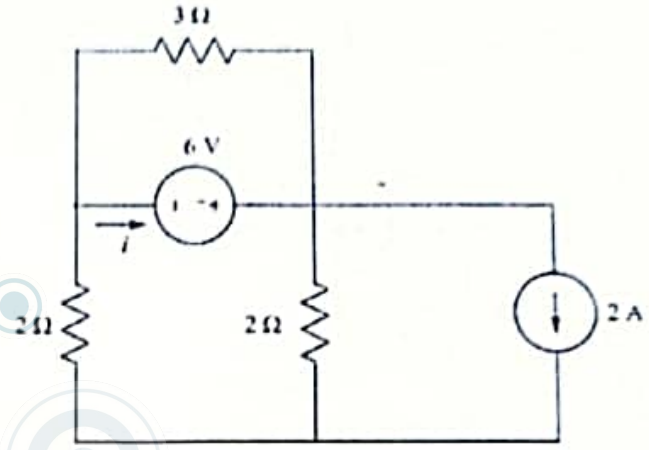
Question # 5 (6 points) **Show Your Calculations**

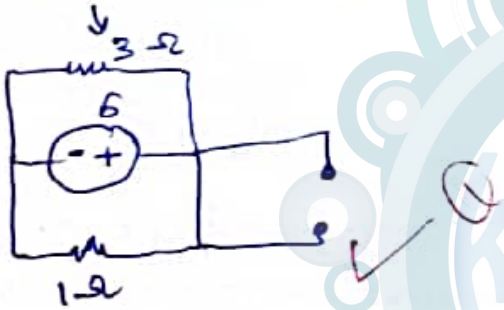
For the circuit shown below, use the principle of superposition to find the current i. Draw the corresponding circuit diagrams

a.	Find the current i_1 due to the 6-V voltage source.	i_1 =	8	A
b.	Find the current i_2 due to the 2-A current source.	i_2 =	∞	A
c.	Find the total current i due to both sources.	i =	8 + ∞ = ∞	A

① Leave 6V



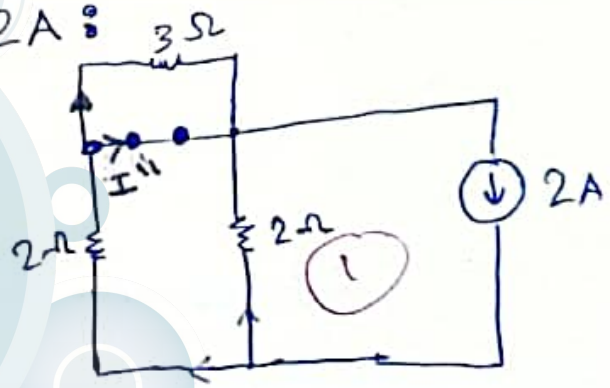




$R_{eq} = 0.75\ \Omega$

$I' = \frac{V}{R} = \frac{6}{0.75} = 8A$

② Leave 2A

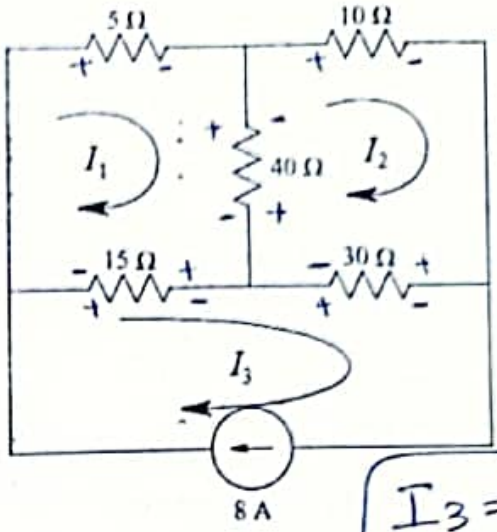


$I'' = \infty$, $R = 0$

Question # 6 (8 points)

For the circuit shown below use mesh current analysis to find the mesh currents I_1, I_2 and I_3.

a.	I_1 =	6	A
b.	I_2 =	6	A
c.	I_3 =	8 A	A



$I_3 = 8A$

I_1 :

$5I_1 + 40(I_1 - I_2) + 15(I_1 - I_2) = 0$

$5I_1 + 40I_1 - 40I_2 + 15I_1 - 15I_3 = 0$

$60I_1 - 40I_2 = 120$ ---①

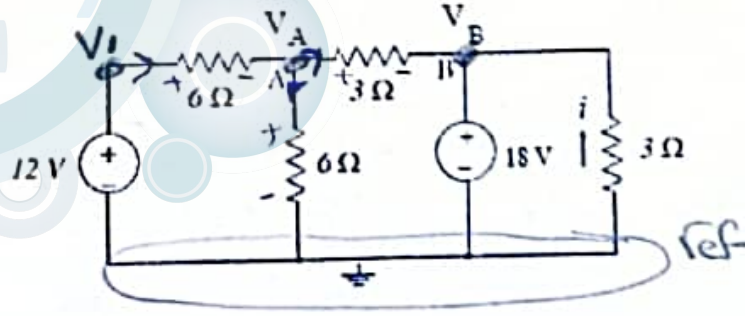
I_2 : $+10I_2 + 30I_2 - 30I_3 + 40I_2 - 40I_1 = 0$

$80I_2 - 40I_1 = 240$ ---②

Question # 7 (5 points)

For the circuit shown below, use node voltage analysis to find the node voltages V_A and V_B.

a.	V_A =	12	V
b.	V_B =	18	V



$\Sigma I_{in} = \Sigma I_{out}$

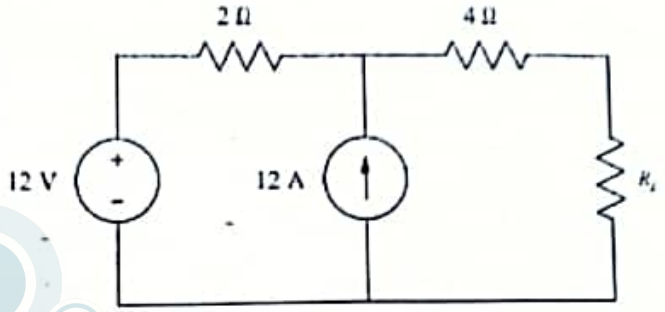
$\frac{12 - V_A}{6} = \frac{V_A - 18}{3} + \frac{V_A}{6}$

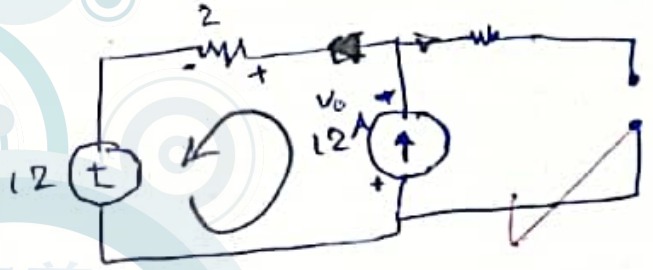
$V_B - 0 = 12$

Question # 8 (7 points)

For the circuit shown below, find

a.	the load resistance R_L for maximum power transfer	R_L =	6	Ω
b.	the Thevenin equivalent voltage	V_{th} =	+36	V
c.	the maximum power absorbed by the load R_L..	P_{max} =	216	W



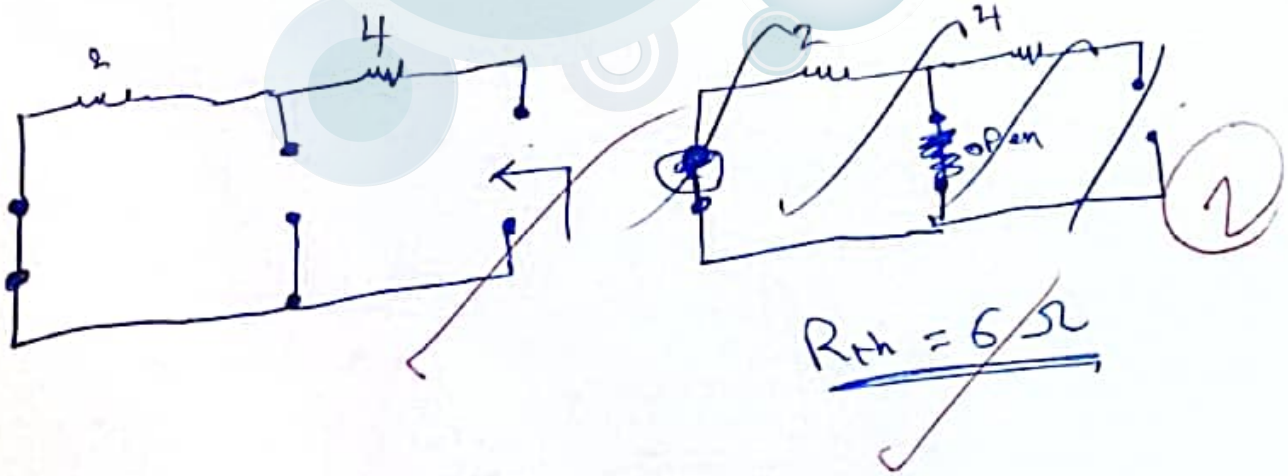


$P_{max} = ?$

Loop: $-V_{th} + 24 + 12 = 0$

$V_{th} = +36$

R_{th}



$R_{th} = 6\ \Omega$