Prof. R. Chedid

FACULTY OF ENGINEERING & ARCHITECTURE

SPRING TERM 2004-05

Name:.....

ID:.....

March 22, 2005

V.1

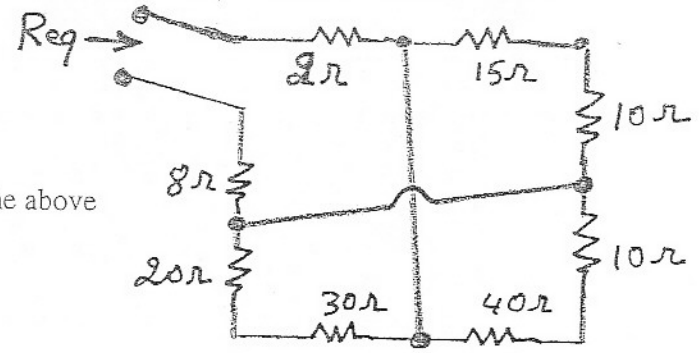
(EECE 210) ELECTRIC CIRCUITS & ELECTRONICS

CLOSED BOOK (1 ½ HRS)

Programmable Calculators are not allowed
Provide your answers on the computer's card only
Return the computer's card attached to the question sheet
Mark with a pencil your name and your ID-No
Use pencil for marking your answers
When using eraser, be sure that you have erased well

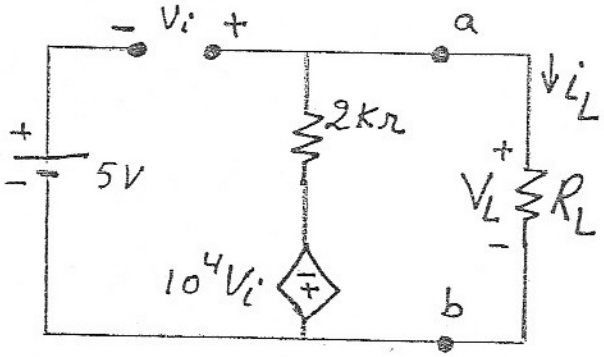
!!! PENALTY IS 6 TO 1 !!!

1. For the circuit shown find R_{eq} seen from terminals a-b



a. 25Ω
b. 14.5Ω
c. 22.5Ω
d. 20.5Ω
e. None of the above

2. Find the Thevenin equivalent voltage V_{th} seen from terminals a-b in the circuit shown:

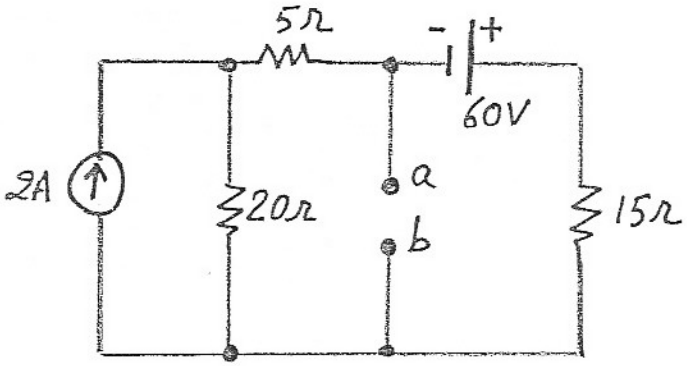


a. 5V
b. 10V
c. $5x10^4$V
d. 2.5 V
e. None of the above

3. Find the equivalent Thevenin resistance seen from terminals a-b in the circuit shown in problem 2.

a. 0.5Ω
b. 1Ω
c. 5Ω
d. 0.2 Ω
e. None of the above

4. Find the Thevenin equivalent voltage V_{th} as seen from terminals a-b in the circuit shown



a. V_{th}=97.5V
b. V_{th}=22.5V
c. V_{th}=-22.5V
d. V_{th}=-37.5V
e. None of the above

$+V_i - 10^4 V_i - 5V = 0$

$V_i(1-10^4) = 5$

$V_i = 5 \times 10^{-4}$

$V_{ab} = -10^4 V_i$

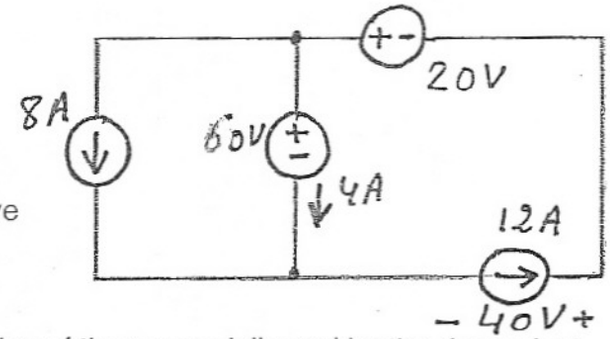
$= 10^4 \times 5 \times 10^{-4}$

5. Find the equivalent Thevenin resistance seen from terminals a-b in the circuit shown in Problem 4.

   a. 6.74Ω
   → b. 9.37Ω
   c. 12.6Ω
   d. 16.32Ω
   e. None of the above

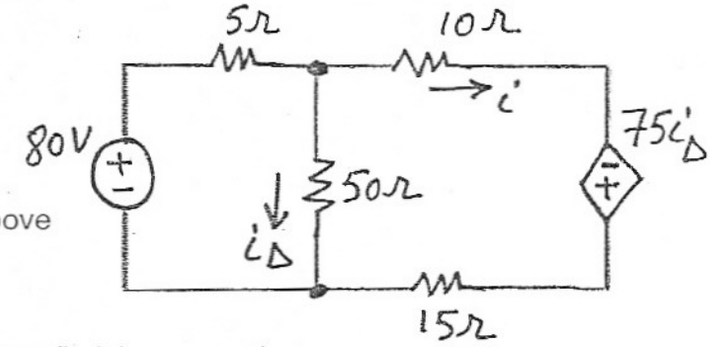
6. Find the absolute value of the power delivered by the circuit

   a. 480W
   b. 240W
   → c. 720W
   d. 450W
   e. None of the above



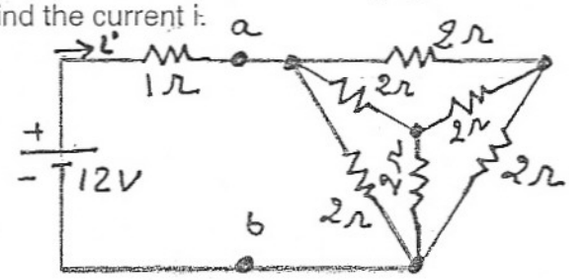
7. Find the absolute value of the power delivered by the dependent voltage source.

   a. 150W
   b. 75W
   → c. 375W
   d. 500W
   e. None of the above



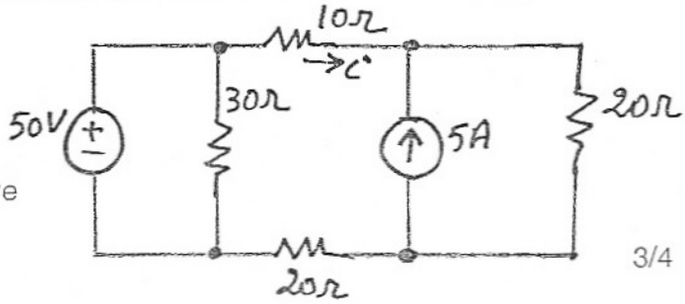
8. For the circuit shown, find the current i.

   a. 2A
   b. 4A
   c. 8A
   → d. 6A
   e. None of the above

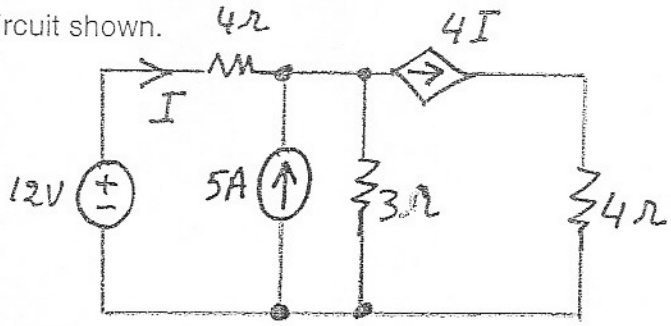


9. Solve for the current i in the 10Ω resistor in the circuit shown

   a. -1.5A
   → b. -1A
   c. 0.6A
   d. 1.6A
   e. None of the above

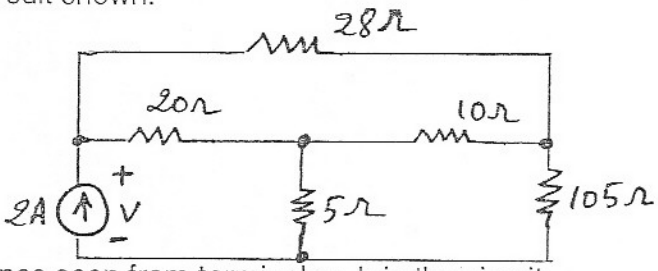


10. Find the current I in the circuit shown.



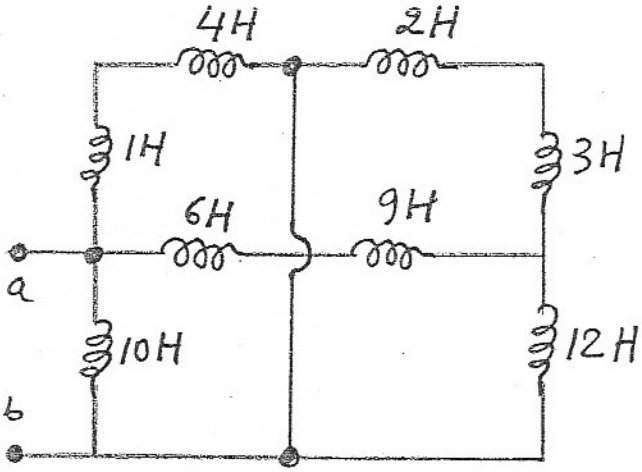
a. 6A
b. 1A
c. 3.2A
d. 0.6A
e. None of the above

11. Find the voltage V in the circuit shown.



a. 43.2V
b. 22.6V
c. 35V
d. 39V
e. None of the above

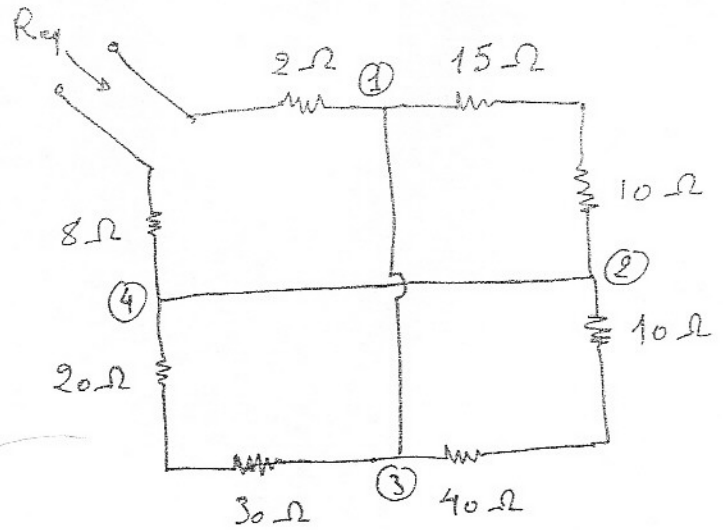
12. Find the equivalent inductance seen from terminals a-b in the circuit shown .



a. ~2.8H
b. ~21.8H
c. ~18.5H
d. ~3.3H
e. None of the above

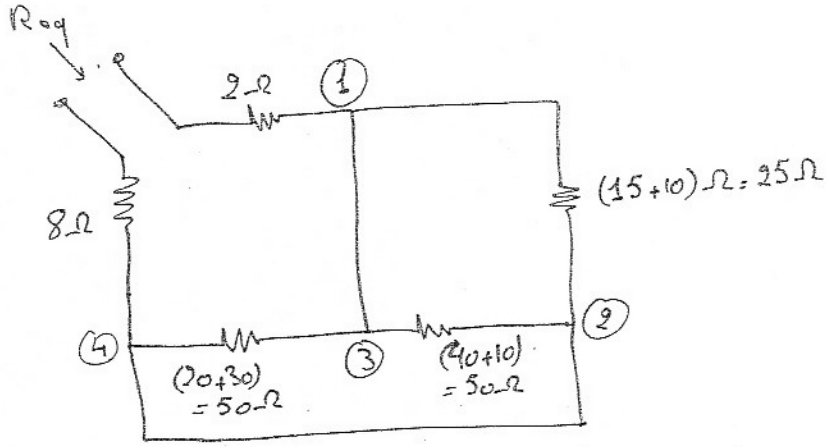
Problem:

Find R_{eq} for the resistive network.

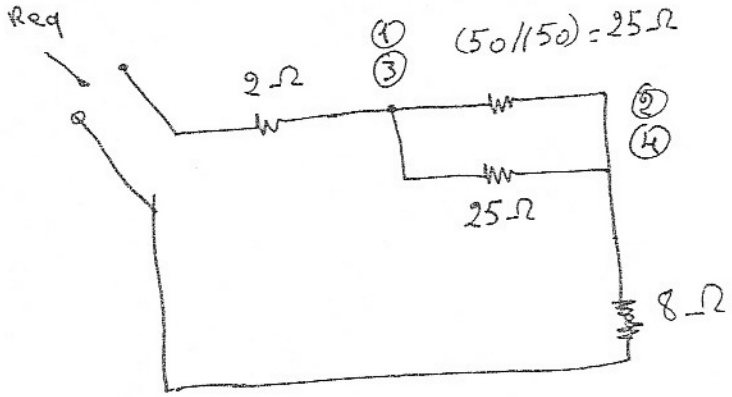


Solution:

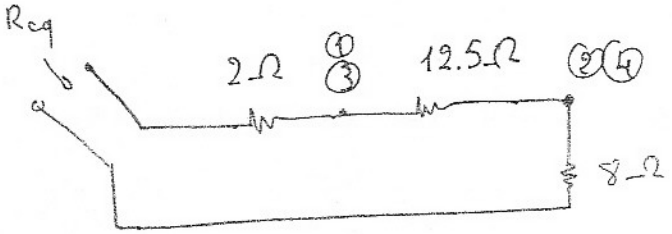
a)



b)



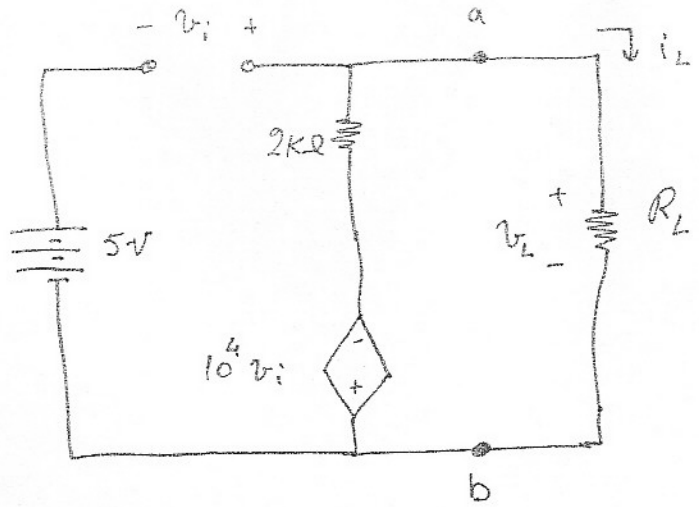
c)



d) $R_{eq} = 22.5\Omega$

Problem 2:

$v_{th} = ??$



with $v_s = 5V$, $R_i = \infty$, $A = 10^4$ and $R_o = 2K\Omega$, To find v_{Loc}, we set $R_L = \infty$, or we simply consider it to be removed from the circuit. There now can be no current through the 2 resistor, and therefore

$$v_{Loc} = -10^4 v_i$$

where

$$v_i = v_{Loc} - 5$$

Therefore

$$v_{Loc} = \frac{10^4(5)}{10001} = 5.00V$$

Next we need a value for i_{Lsc}; we replace R_L by a short circ

Around the right mesh, KVL gives

$$10^4 v_i + 2000\, i_{Lsc} = 0$$

with the application of KVL around the perimeter of the circuit gives: $-5 - v_i = 0$

Therefore: $10^4(-5) + 2000\, i_{Lsc} = 0$

and $i_{Lsc} = 25.0\ A$

Problem 3:

R_{th} for problem 2 = ??

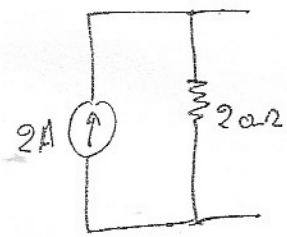
$$R_{th} = \frac{v_{Loc}}{i_{Lsc}} = \frac{5.00}{25.0} = 0.2\,\Omega$$

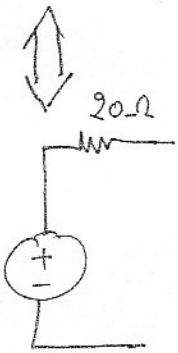
Thus, the Thevenin equivalent presented to R_L at ⓐ-ⓑ by the voltage follower is 5.00 V in series with a very lo value of resistance $0.2\,\Omega$.

Problem 4:

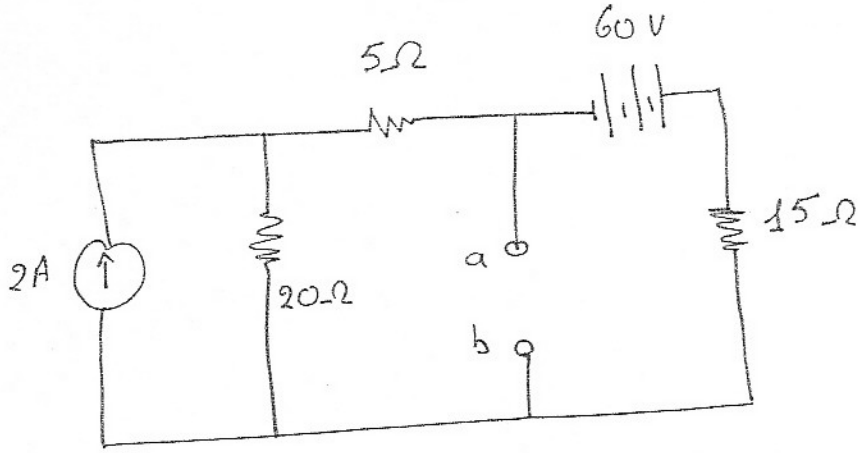
find

v_{th} = ??

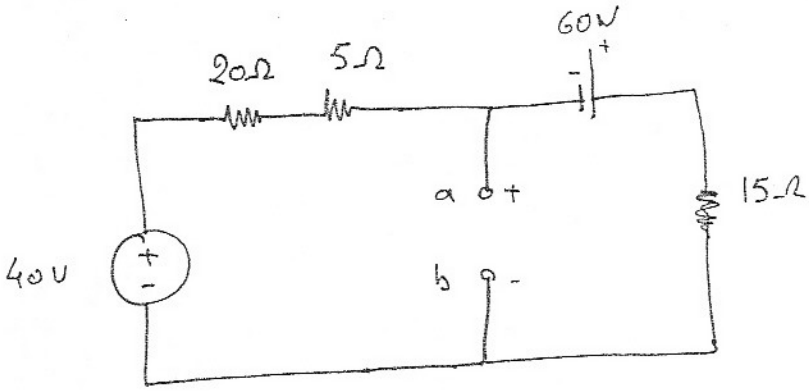




a)



b)



$$\Rightarrow \quad -40 + 25i - 60 + 15i = 0$$

$$\Rightarrow 40i = 100 \Rightarrow i = \frac{10}{4}$$

$$\& \quad -v_{ab} - 60 + 15 \times \frac{10}{4} = 0$$

$$\Rightarrow v_{ab} = \frac{150}{4} - 60 = -22.5\,V$$

Problem 5:

Find R_{th} for problem (4)

$i_{sc} = ??$

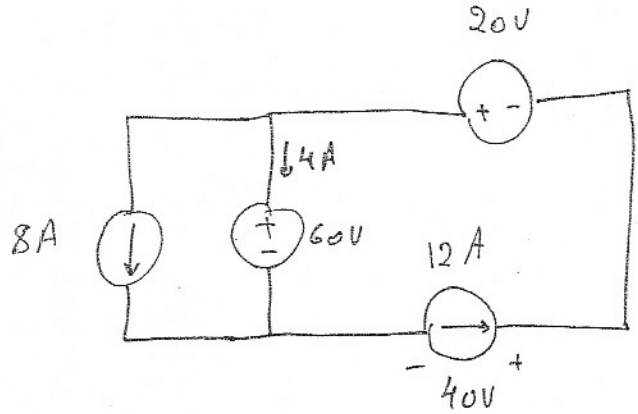
$$i = i_1 + i_2$$

$$= \frac{40}{25} - \frac{60}{15} = \frac{40}{25} - 4 = 1.6 - 4 = -2.4$$

$$\Rightarrow R_{th} = \frac{22.5}{2.4} = 9.37\ \Omega.$$

Problem 6:

Find the absolute value of the power delivered by the circuit.



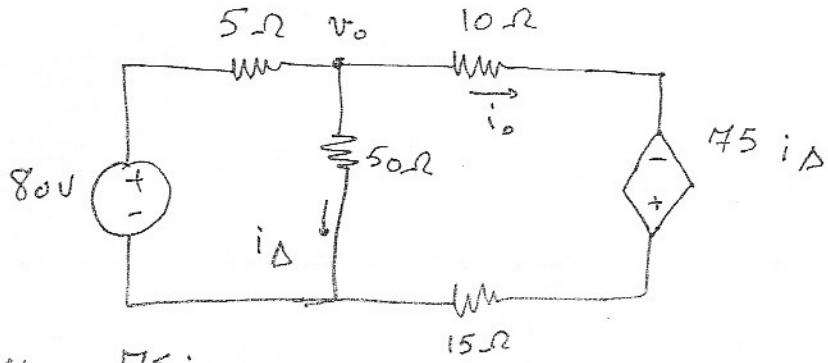
(KVL) : $-60 + 20 + 40 = 0$

(KCL) : $10 + 4 + 12 = 0$

$$\Sigma P_{dev} = 4(60) + 8(60) = 720\ W$$

Problem 7:

Find the absolute value of the power delivered by the depende voltage source.



$$\frac{v_o - 80}{5} + \frac{v_o}{50} + \frac{v_o + 75 i_\Delta}{25} = 0 \quad \ldots (1)$$

$$i_\Delta = \frac{v_o}{50} \quad \ldots\ldots\ldots\ldots (2)$$

Solving eq (1) & (2), $v_o = 50\ V$ & $i_\Delta = 1\ A$.

$$i_o = \frac{50 - (-75)(1)}{25} = 5\ A$$

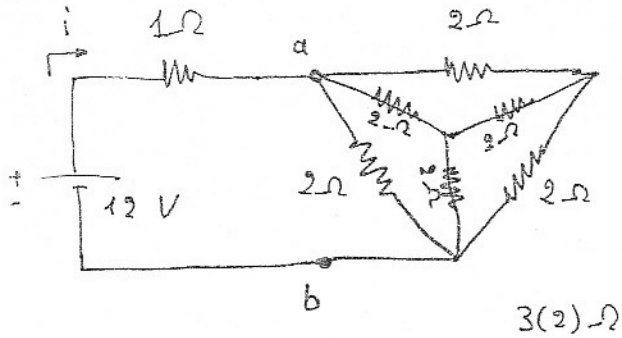
$$P_{75 i_\Delta} = 75 i_\Delta \cdot i_o = -375\ W.$$

=> The dependent voltage source delivers 375 W to the circu

Problem 8:

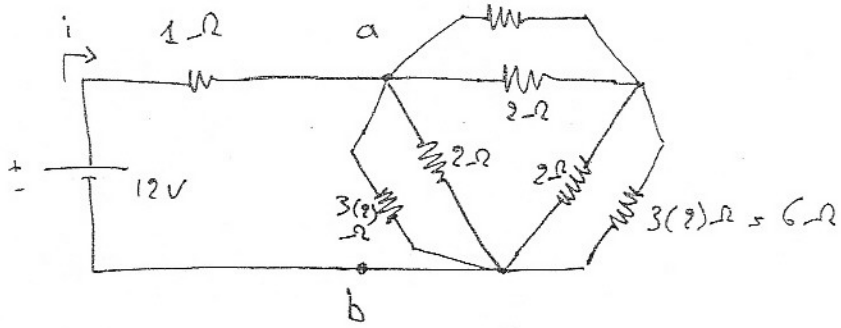
Find the current i

a)

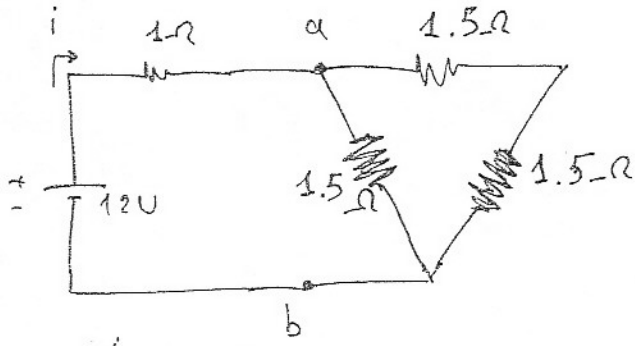


$3(2)\Omega = 6\Omega$

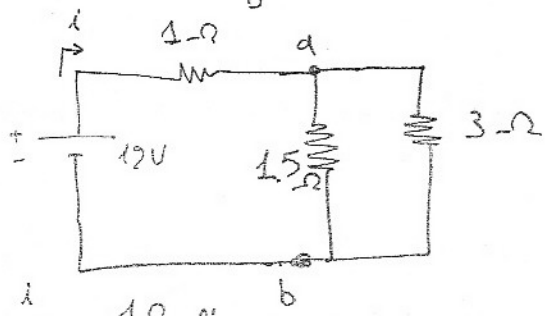
b)



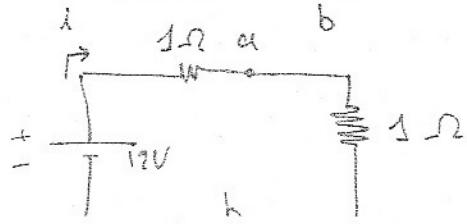
c)



d)



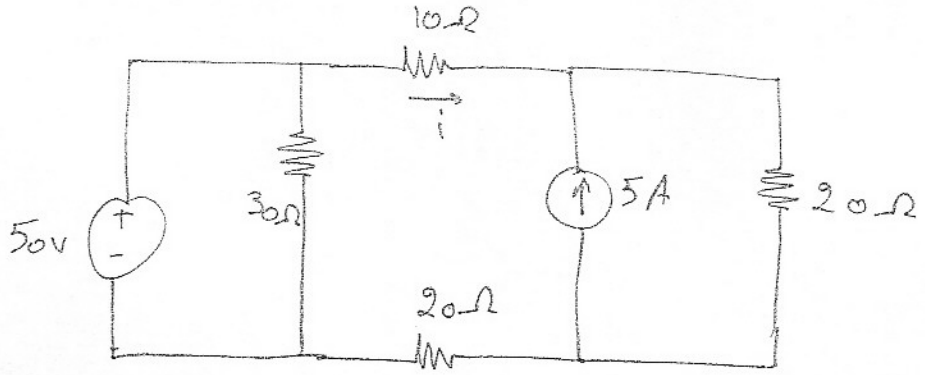
e)



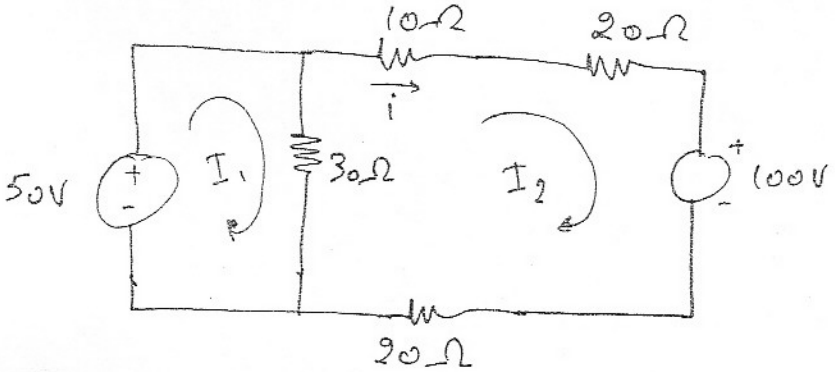
$$\Rightarrow i = \frac{12}{2} = 6\ A$$

Problem 9:

Solve for the current i in the 10Ω resistor in the circuit shown



by source transformation we obtain:



Thus,

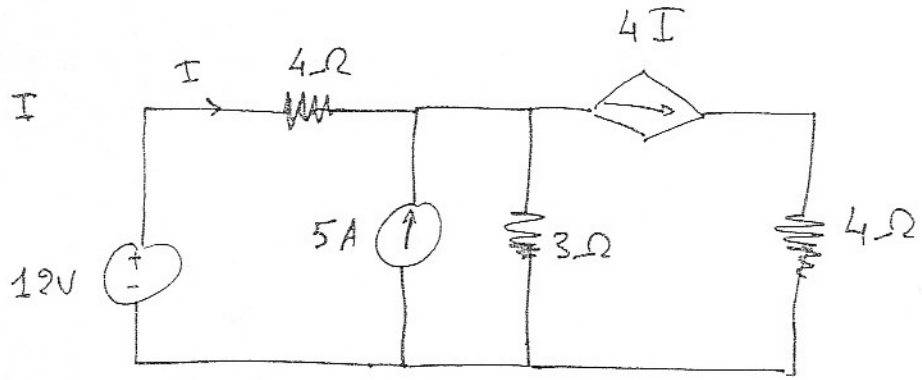
$$50 = 30I_1 - 30I_2 \quad \& \quad -100 = -30I_1 + 80I_2$$

Solving these eqs. $\Rightarrow -50 = 50I_2$

$$\Rightarrow I_2 = I_{10\Omega} = -1\,A$$

Problem 10:

Find the current I



Writing the nodal equations $\Rightarrow$

$$\frac{12 - V}{4} + 5 = \frac{V}{3} + 4I \quad \& \quad I = \frac{12 - V}{4}$$

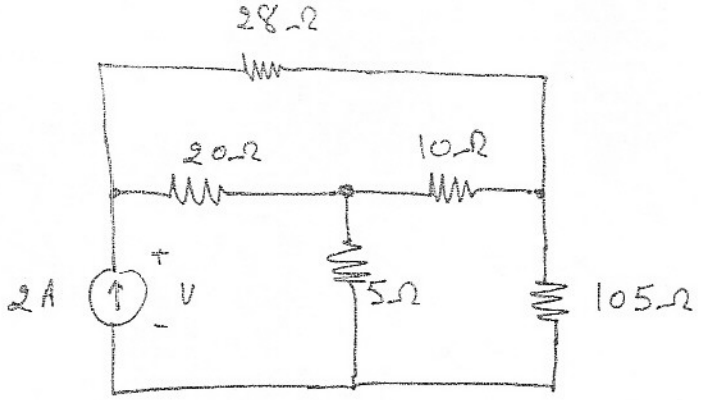
Solving these equations $\Rightarrow$

$$I = 0.6\,A$$

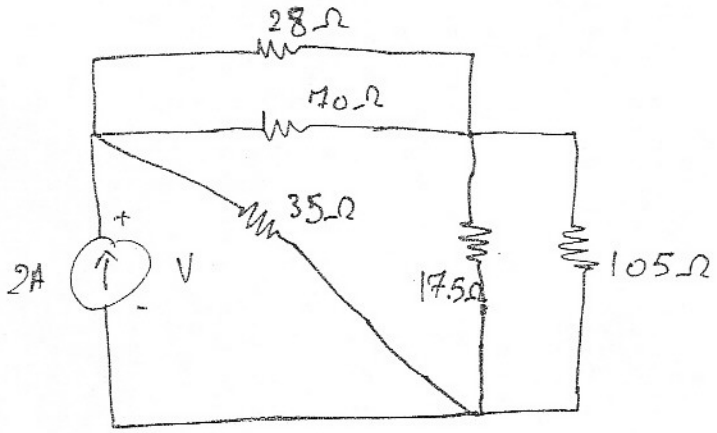
Problem 11:

Find the voltage V

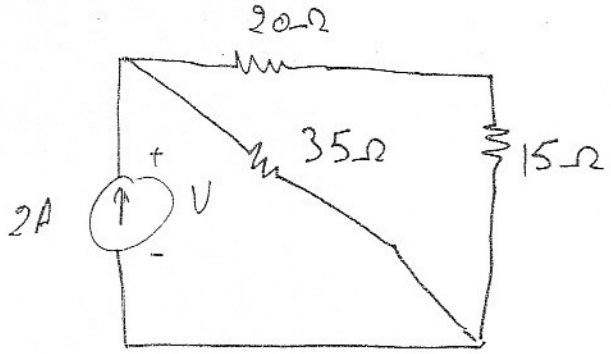
a)



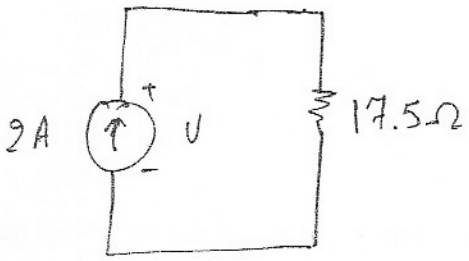
b)



c)



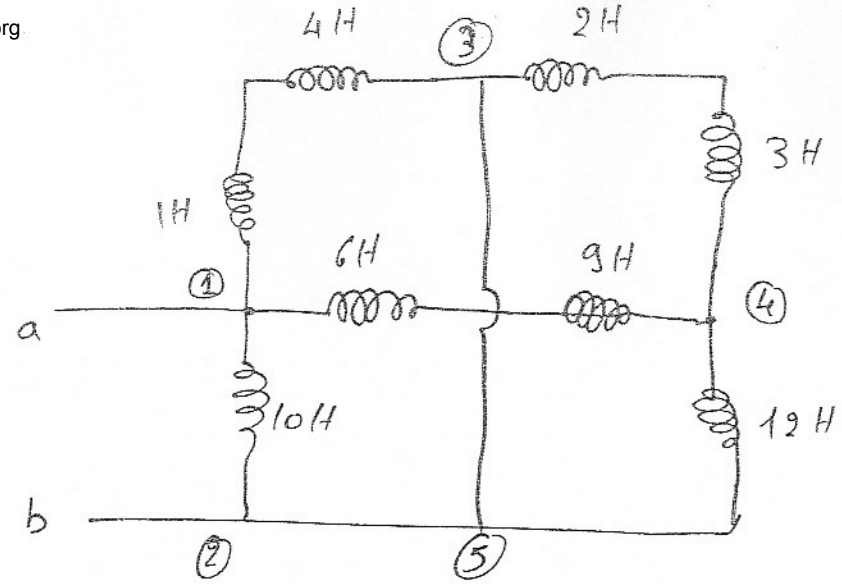
d)



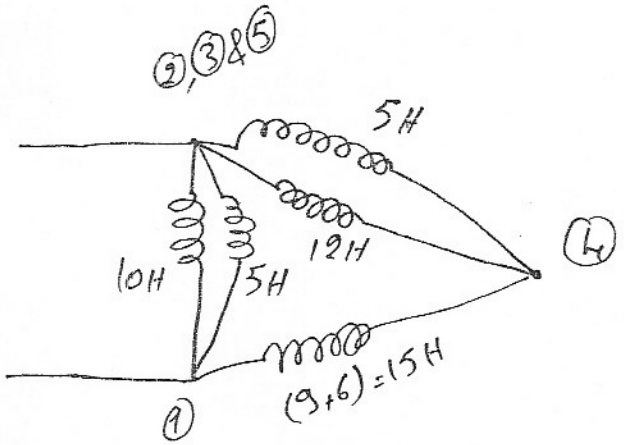
$\Rightarrow V = RI = 17.5 \times 2 = 35\ V$

Problem 12:

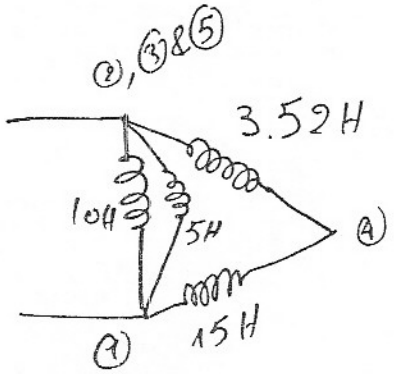
a)



b)



c)



d) $\frac{1}{L_{eq}} = \frac{1}{10} + \frac{1}{5} + \frac{1}{18.52}$

$\Rightarrow L_{eq} = 2.82\ H$