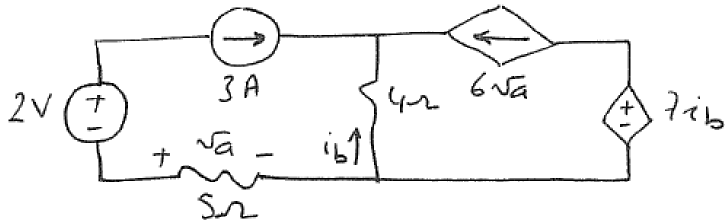
**PR.2** Given the circuit, determine whether the dependent voltage source is supplying or absorbing power; then find that power.




(a) $P_{absorbed}$=58.6W (b) $P_{absorbed}$=40W

(c) $P_{delivered}$=58.6W (d) $P_{delivered}$=450W

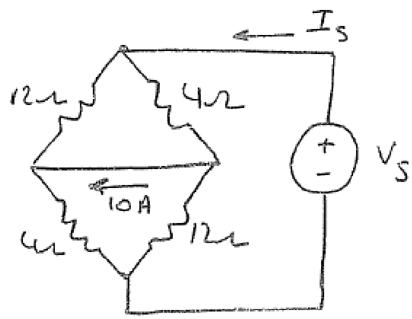
→ (e) none of the above 54.81 kW

**PR.3** A resistor draws a current I=8Sinwt at a voltage V=200Sinwt. Calculate the average power dissipated in the resistor.

(a) 400W → (b) 800W (c) 1600W

(d) 0W (e) none of the above

**PR.4** Find $V_S$ and $I_S$ in the following circuit:




(a) $I_S$=10A

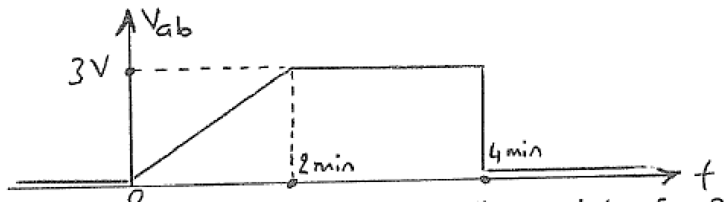
(b) $I_S$=30A

(c) $V_S$=60V

(d) $I_S$=20V

→ (e) none of the above 120 V, 20 A

**PR.5** Given a 2Ω resistor connected between terminals a an b and given that the voltage is shown in the graph below:




Find the power delivered by the resistor for 0<t<2min.

(a) $9t^2/8$ (b) $-9t^2/8$ (c) $-3t^2/960$
(d) $3t^2/960$ → (e) none of the above $t^2/3200$ W, $t$ is in s

**PR.6** For the same given of problem 5, find the energy in joules converted into heat by the resistor for 2<t<4min.

→ (a) 540 (b) 180 (c) 1080
(d) 90 (e) none of the above

**PR.7** A 110 light bulb takes 0.9A and operates 12h/day. At the rate of 7cents/Kwh, find the cost to operate the bulb for 30 days.

(a) 5$ → (b) 2.5$ approx (c) 2$
(d) 252¢ (e) none of the above

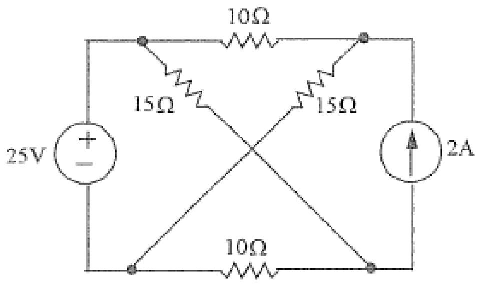



**Figure 1**

**1.** In the circuit shown in figure 1, calculate the total power delivered by the two sources.

a) 88 W
b) 72 W
**c) 98 W**
d) 110 W
e) None of the above

Hint: redraw as a bridge circuit

**2.** A 1Ω resistor is connected in parallel with a d'Arsonval movement having a full scale deflection of 1 mA. If a 40 mA current produces a deflection that is 80% of full scale, determine the resistance of the d'Arsonval movement.

a) 58Ω
**b) 49Ω**
c) 37Ω
d) 76Ω
e) None of the above

**3.** A 1 cm cube of material has a resistance of 2.5KΩ measured between opposite faces. Calculate the resistance of a rectangular block of this material that is 50 cm long and of 10 $cm^2$ cross-sectional area.

a) 10.8KΩ
**b) 12.5KΩ**
c) 22.0KΩ
d) 760Ω
e) None of the above

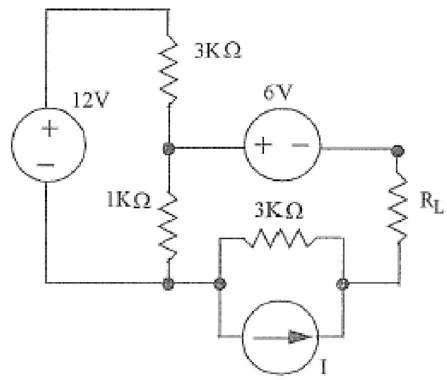



**Figure 2**

**4.** In the circuit shown in figure 2, determine I so that no current flows in $R_L$.

a) 3mA
b) 0mA
c) 2mA
**d) -1mA**
e) None of the above

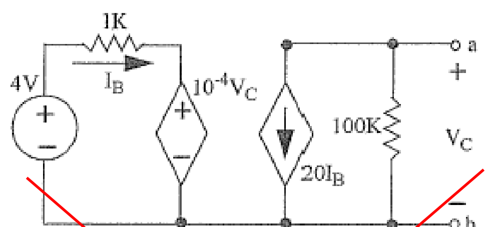



**Figure 3**

**5** In the circuit shown in figure 3, determine the resistance $R_L$ that should be connected between terminals ab for maximum transfer.

a) 100KΩ
**b) 125KΩ**
c) 1KΩ
d) 360Ω
e) None of the above

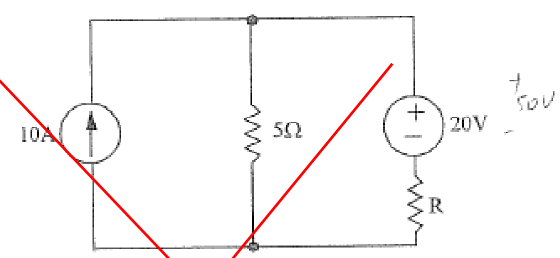



Figure 4

6. In the circuit shown in figure 4, determine the maximum power dissipation in the 5Ω resistor.

a) 300 W
b) 150 W
c) 45 W
**d) 500 W**
e) None of the above

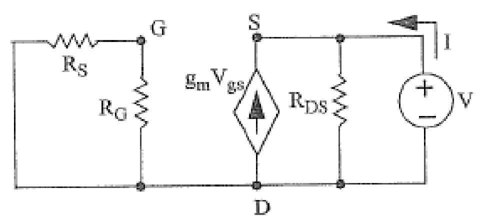



Figure 5

7. In the circuit shown in figure 5, determine determine $R_o = V/I$, if $V_{gd} = 0$.

a) $R_o = R_{DS} \| R_G$
b) $R_o = R_{DS}$
**c) $R_o = R_{DS} \| (1/g_m)$**
d) $R_o = R_S \| R_G \| R_{DS}$
e) None of the above

8. In the circuit shown in Figure 6, find $v_1$ and the voltage v across both sources if $i_s$ is given as 12 A.

a) $v_1 = 30V$ and $v = 22.5V$
b) $v_1 = 0.6V$ and $v = 2.25V$
**c) $v_1 = 30V$ and $v = 225V$**
d) $v_1 = 6V$ and $v = 225V$

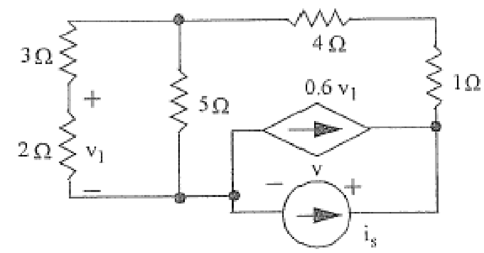



Figure 6

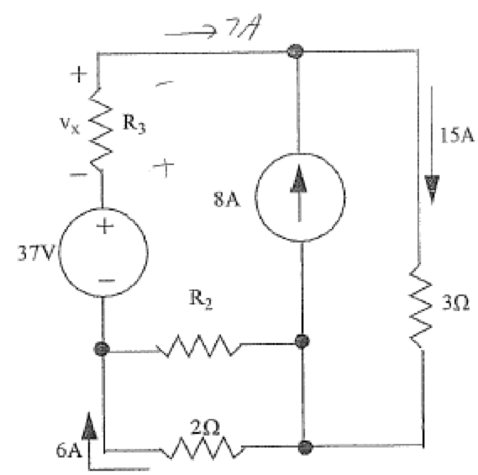



Figure 7

9. Determine $v_x$ in the circuit of figure 7.

**a) $v_x = 20V$**
b) $v_x = -30V$
c) $v_x = -20V$
d) $v_x = 15V$
e) None of the above

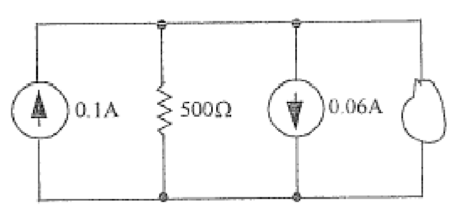



Figure 8

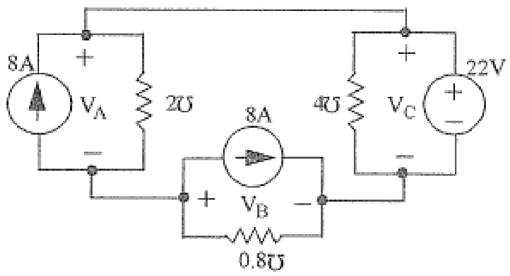



Figure 9

Hint: transform current sources to voltage sources

**11.** In the circuit of figure 9 find $V_A$, $V_B$ and $V_C$. Note that the resistors are labeled with their respective conductances.

$V_A$ = 12 V, $V_B$ = 10 V, $V_C$ = 22 V

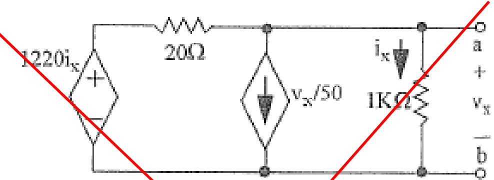



Figure 10

**12.** Find the Thevenin equivalent of the circuit shown in figure 10.

a) $V_{th}$ = 10V and $R_{th}$ = 1K

**b) $V_{th}$ = 0V and $R_{th}$ = 0.1K**

c) $V_{th}$ = 10V and $R_{th}$ = 2K

d) $V_{th}$ = 1V and $R_{th}$ = 1K

e) None of the above

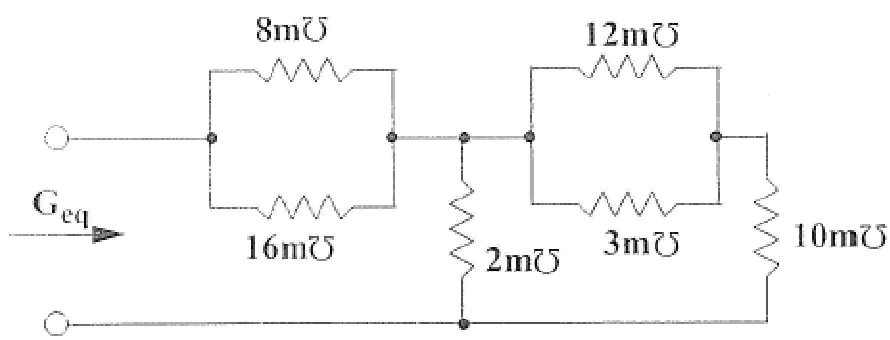



Figure 1

**2.** Find Geq for the network of figure 1. (round off your answer to 2 decimals).

a) 5 mhos

b) 7 mhos

c) 6 mhos

d) 4 mhos

e) None of the above

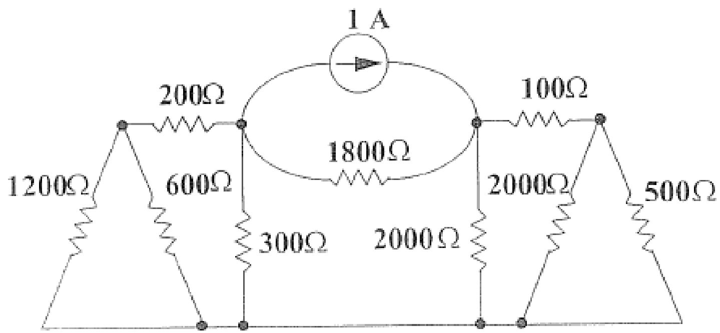



Figure 3

**4.** Given the circuit of figure 3. Find the power ($p_{source}$) supplied by the source and also the power ($p_{1800}$) absorbed by the 1800Ω resistor.

a) $p_{source} = 450$ W ; $p_{1800} = 112.5$ W

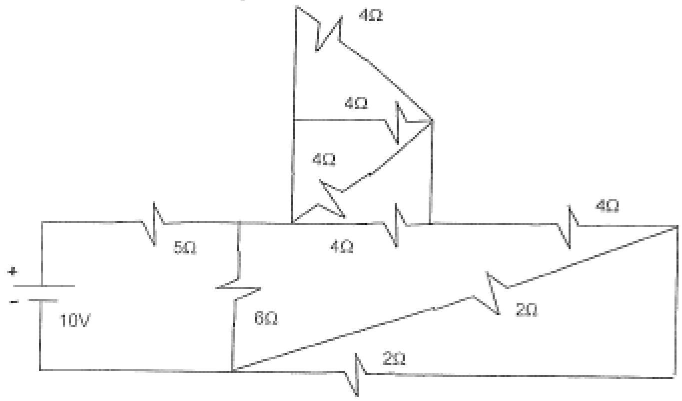
b) $p_{source} = 4.5$ W ; $p_{1800} = 1.125$ W

c) $p_{source} = 112.5$ W ; $p_{1800} = 28.125$ W

d) $p_{source} = 18$ W ; $p_{1800} = 4.5$ W

e) None of the above

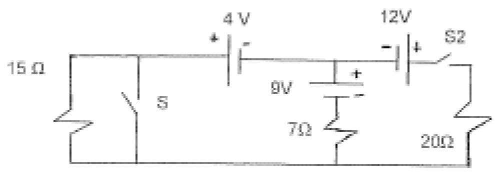
7. Consider the following circuit:




The equivalent resistance of the above circuit is:

A. 11Ω
B. 8 Ω
C. 6.2 Ω
D. 4 Ω
E. None of the above

8. Consider the following circuit:



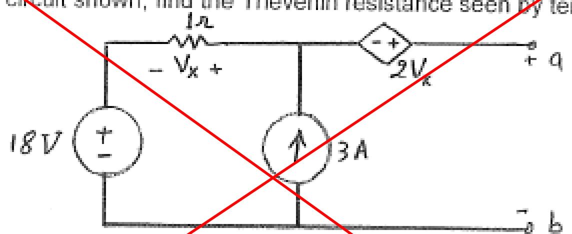

Assume switches S1 and S2 are both open, the current in the 15 Ω resistor is:

A. 0.34A
B. 1.86A
C. 0.59A
D. 0 A
E. None of the above

9. In problem 8, assume switches S1 and S2 are both closed, the power generated by the 12V battery is:

A. 4.8W
B. –8.76W
C. 17.52W
D. 8.76W
E. None of the above.

10. For the circuit shown, find the Thevenin resistance seen by terminals ab

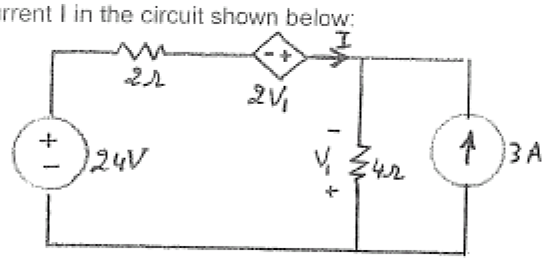



A. 4Ω
B. 5Ω
C. 3Ω
D. 6Ω
E. None of the above.

Test ID 1000- 4/5

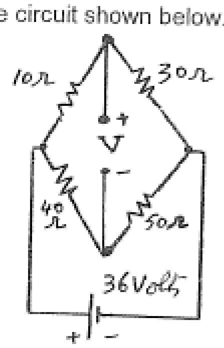


11. Find the current I in the circuit shown below:




A. 24/14 A
B. −0.857 A
C. −3A
D. 4A
E. None of the above.

13. Find the Voltage V in the circuit shown below.




A. 25 V
B. 7 V
C. 16 V
D. 9 V
E. None of the above

2. In the circuit of Figure 1, the Thevenin resistance as seen from terminals ab is:

a. 100/3Ω
b. 100/9Ω
c. 50/9Ω
d. 10Ω
e. None of the above



3. In the circuit of Figure 2, the equivalent resistance seen across the terminals ab is:

a. 7Ω
b. 7.5Ω
c. 6Ω
d. 6.5Ω
e. None of the above

Refer to figures below

4. The current $I_1$ across the 6V source in Figure 3 is:

a. 1.5A
b. 4.5A
c. 3A
d. 3.5A
e. None of the above

5. Find k in the circuit shown in Figure 4 such that the power dissipated in the 2-Ω resistor is 50W.

a. 5
b. 2
c. 10
d. 4
e. None of the above

9. Find the resistance R in the circuit of Figure 7 such that the power supplied by the 100-V source to the network is the same as the power supplied by the 5-A source.

a. 20Ω
b. 30Ω
c. 10Ω
d. 40Ω
e. None of the above

10. In the circuit of Figure 8, the Thevenin equivalent resistance, across terminals a-b, is:

a. 20Ω
b. 5Ω
c. -20Ω
d. 10Ω
e. None of the above

11. The current entering a circuit is shown in Figure 9. Determine the amount of charge that enters the circuit as a result of the current pulse.

a. 20mC
b. 40mC
c. 80mC
d. 60mC
e. None of the above

12. Four 60-W, 110-V light bulbs are to be operated from a 230-V source (see Figure 10). Determine the value of the resistance, R, connected in series with the line so that the voltage across the bulbs does not exceed 110-V.

a. 2Ω
b. 55Ω
c. 120Ω
d. 60Ω
e. None of the above



13. The power absorbed by the 4-Ω resistance of Figure 11 is:

a. 100W
b. 50W
c. 75W
d. 90W
e. None of the above.

14. In the circuit of Figure 12, the power delivered by the 10-V source is:

a. 20W
b. -40W
c. 40W
d. 60W
e. None of the above.

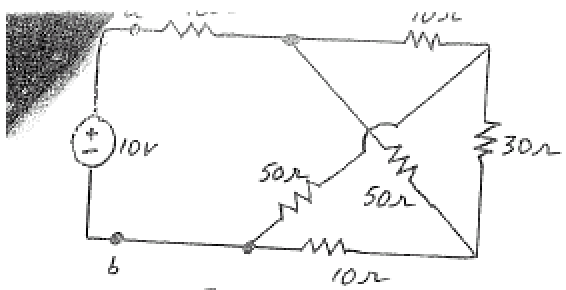


Fig.1

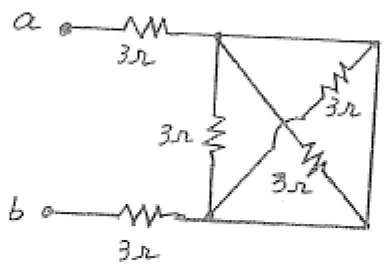


Fig.2



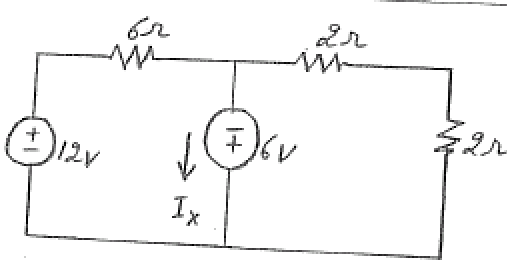


Fig.3

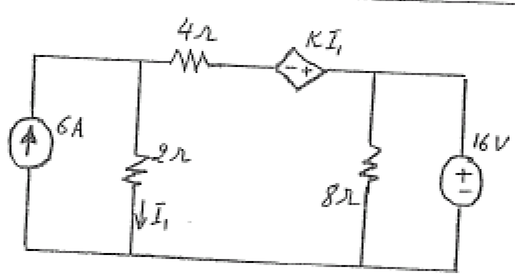


Fig.4

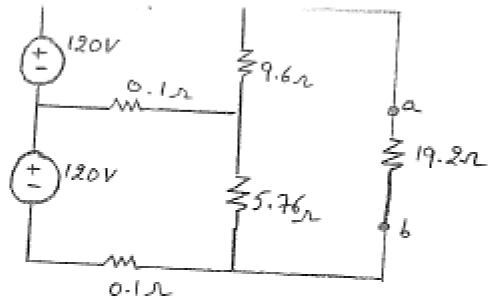


Fig.5

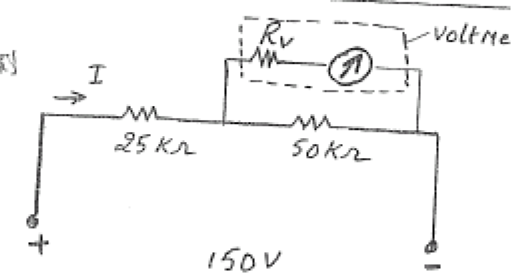


Fig.6

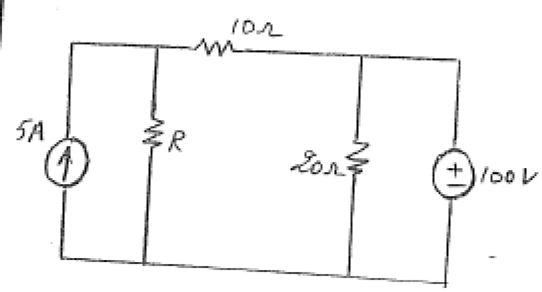


Fig.7

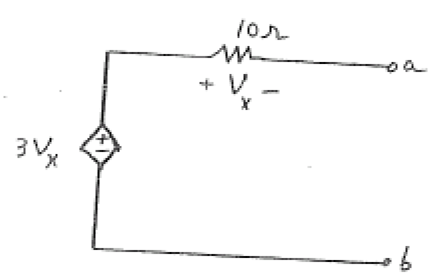


Fig.8

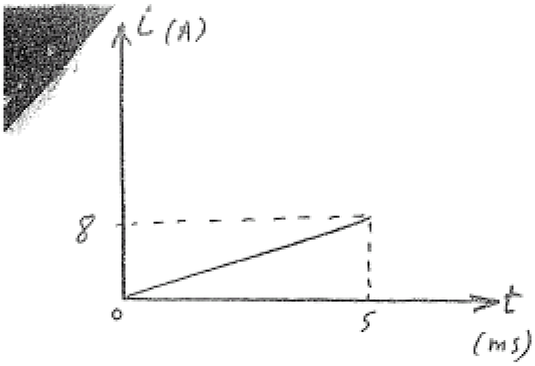



Fig.9

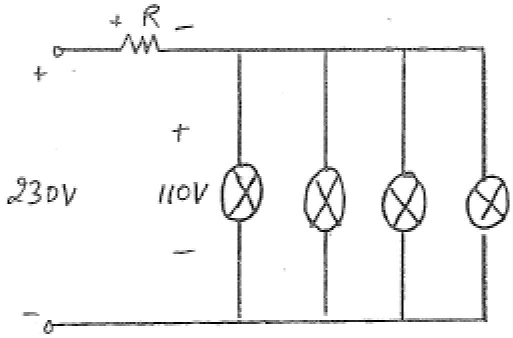



Fig.10

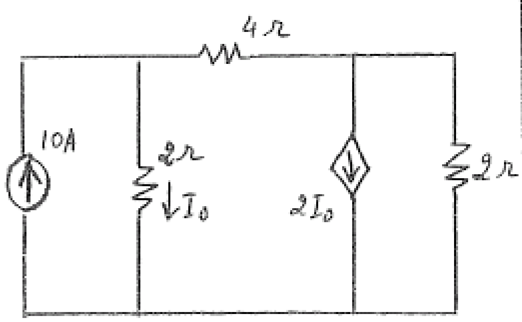



Fig. 11

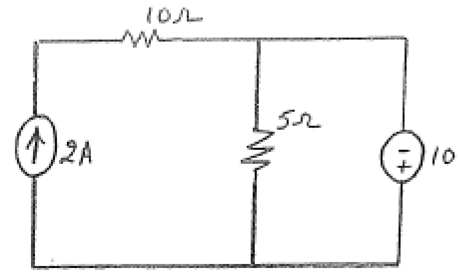



Fig.12

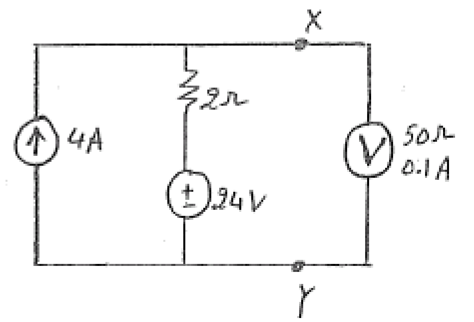
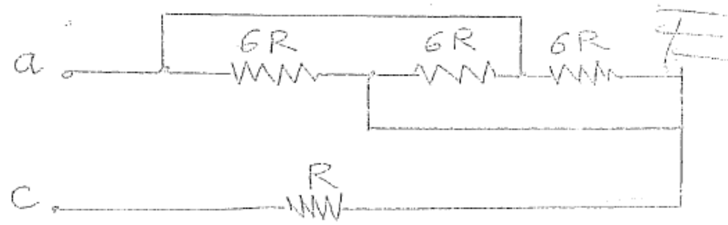





Fig.13

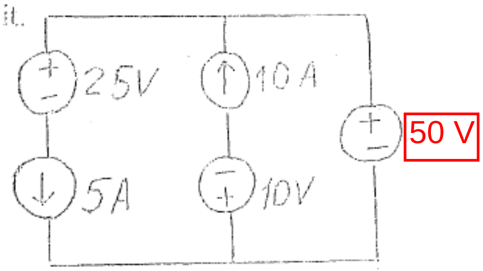
2 - In the circuit shown below, determine the equivalent resistance Rac.

a) 10 R
b) 18 R
c) 2 R
d) 3 R
e) none of the above

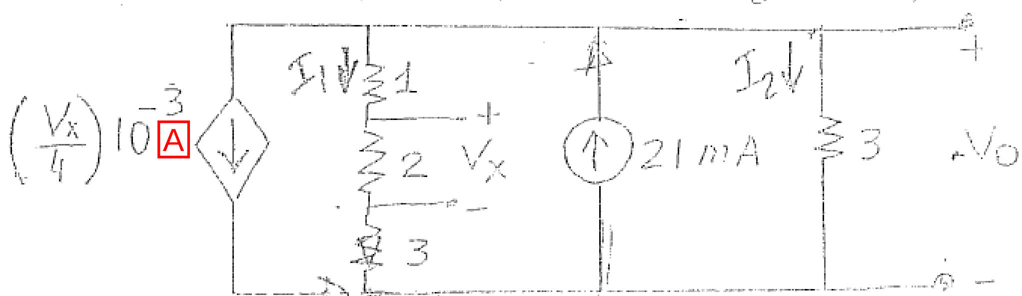



3 - If the interconnection of different sources in the following circuit is valid, find the total absorbed and delivered power in this circuit.

a) The interconnection is not valid
b) P(absorbed) is 2400 W, P(delivered) is 2400 W
c) P(absorbed) is 450 W, P(delivered) is 450 W
d) P(absorbed) is 600 W, P(delivered) is 600 W
e) none of the above



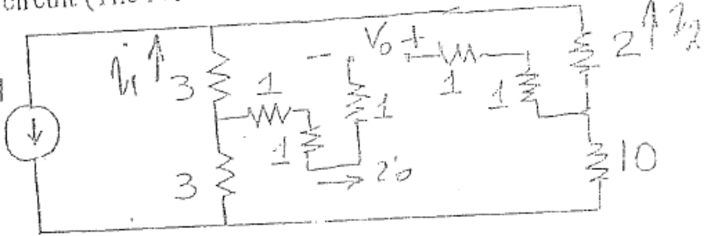

5 - Given the network below, find Vo. (The resistance are given in KΩ)



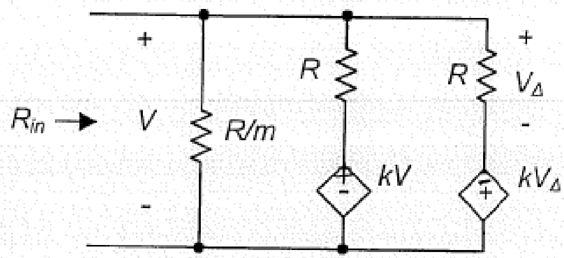

a) $36*10^{-3}$ V, b) 41 V, c) 36 V, d) 63 V
e) none of the above

7- Find Vo in the following circuit (The resistance are given in Ohm)

a) Vo = 5 V
b) Vo = – 200 V
c) Vo = – 20 V
d) Vo = – 25 V
e) none of the above

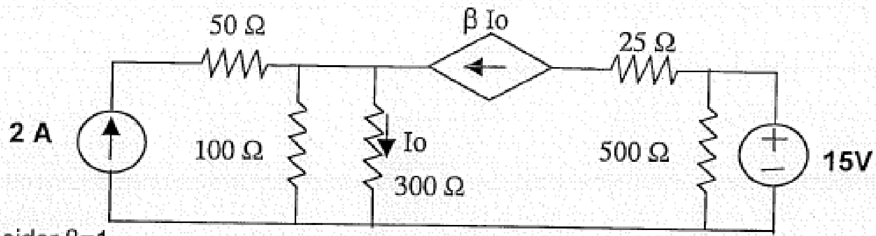


1. Determine $R_{in}$ in the figure, given that $R = 1$ kΩ, $m = 2$, and $k = 2$.




→ A. Infinite
B. Zero Ω
C. 1 kΩ
D. 2 kΩ
E. None of the above

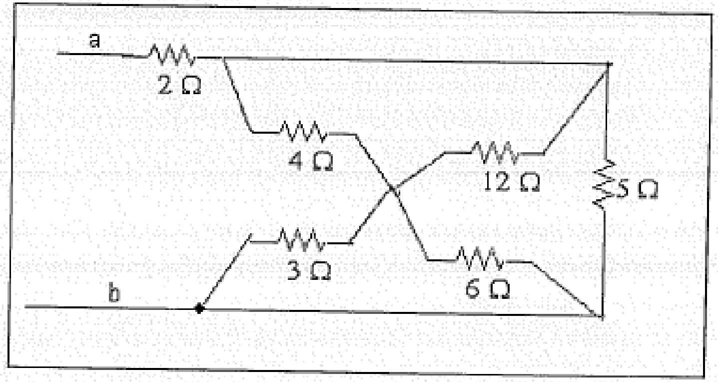
2. Considering the circuit below, find the current Io flowing through the resistor 300Ω.




Consider β=1

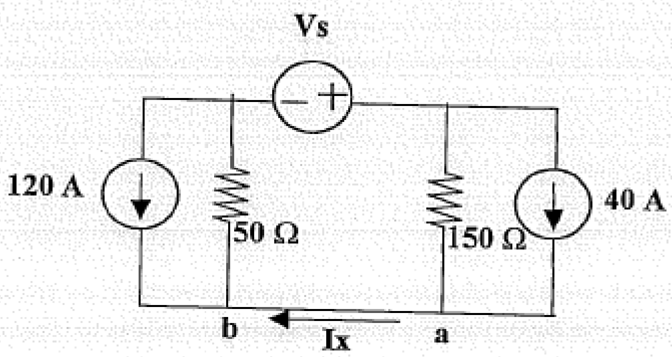
→ a) 0.667 A
b) 1.000 A
c) 1.333 A
d) 2.000 A
e) None of the above

11. Find the equivalent resistance between the terminals (a,b).



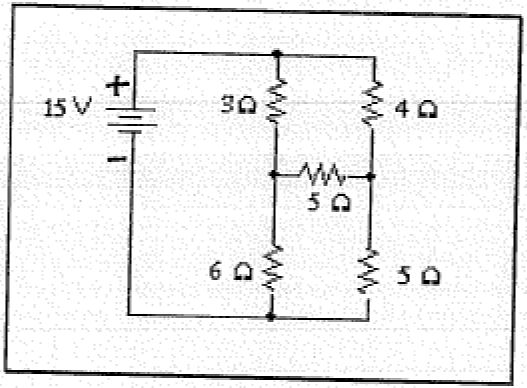

a) 4.50 Ω
b) 2.25 Ω
c) 12.5 Ω
d) 8.0 Ω
e) none of the above

2. In the circuit below, find the value of the current **Ix** flowing between node a and node b. (Vs =10V)




a) +50mA
b) +100mA
c) –30 A
d) +30A
e) None of the above

10. For the circuit shown below determine the power supplied by the source.

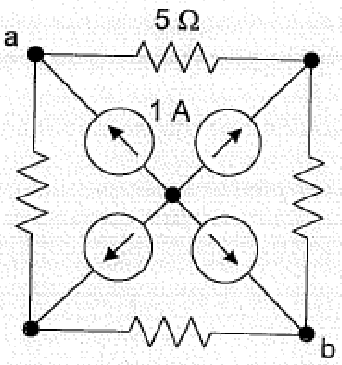



a. 63.1 W
b. 36.3 W
c. 21.6 W
d. 50.3 W
e. None of the above

7%

3. Determine $V_{ab}$, given that all current sources are 1 A and all resistances are 5 Ω.

A. 5 V
B. 10 V
C. 15 V
D. 20 V
E. Not a valid connection



8%

1. Determine $R_{eq}$.

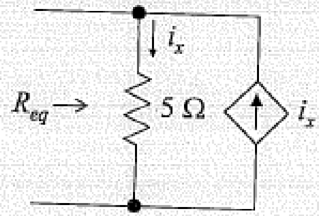
   A. 5 Ω

   B. 10 Ω

   C. 0

   D. Infinite

   E. None of the above




***Solution*:** If a source $v_T$ is applied, the source current is $i_T = i_x - i_x = 0$. The resistance seen by the source $R_{eq}$ is therefore infinite.

8%

2. Determine $I_x$ in the circuit shown.

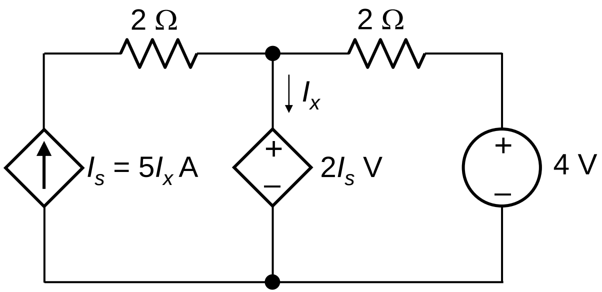
   A. 2 A

   B. 4 A

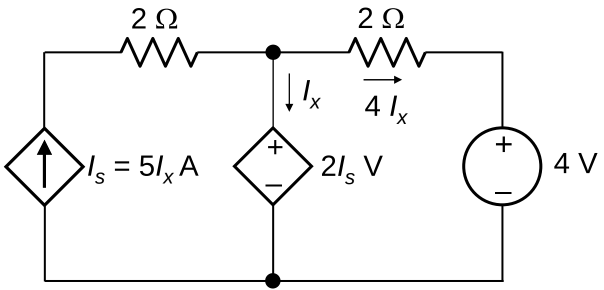
   C. -2 A

   D. -4 A

   E. None of the above

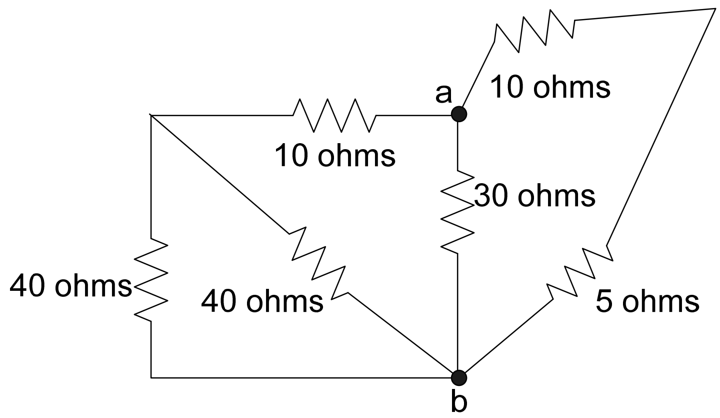



**Solution:** KCL at the upper node gives a current of $4I_x$ in the 2 Ω resistor; $2I_s = 10I_x$; from KVL around the right mesh: $10I_x = 8I_x + 4$, so that $I_x = 2$ A.



**Problem 1**
Find $R_{ab}$.

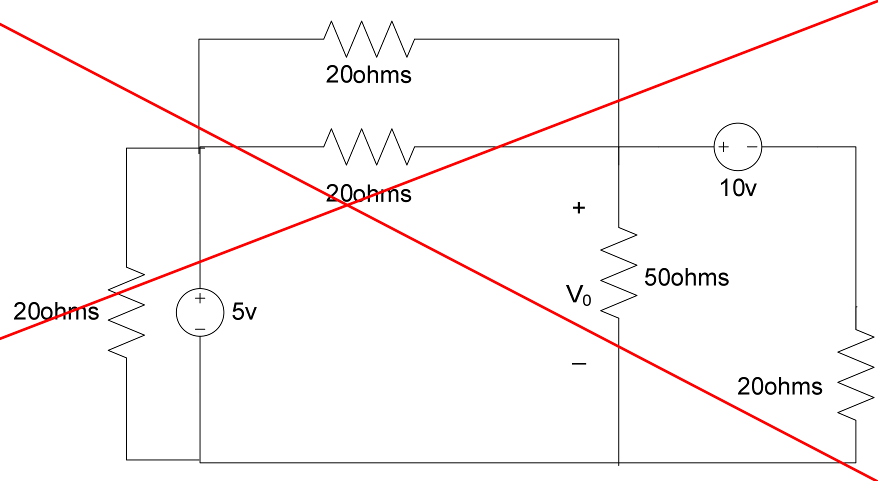
A) 12 ohms
B) 7.5 ohms
C) 10 ohms
D) 15 ohms
E) None of the above




**Problem 2**

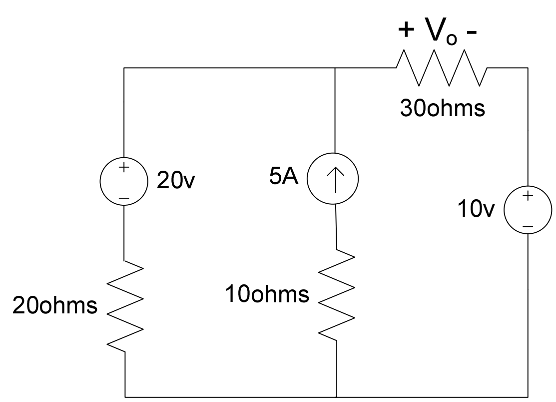
Find the power consumed by the 50 ohm resistor in the circuit shown below

A) P= 0.246 W
B) P= 0.692 W
C) P= 2.358 W
D) P= 5.100 W
E) None of the above

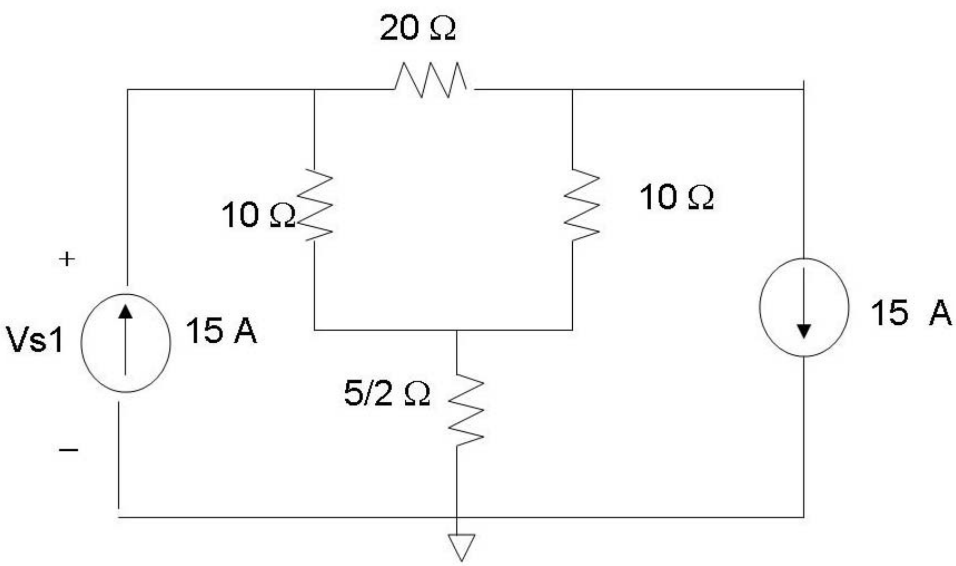



**Problem 3**
Find $V_0$ in the 30 Ohm resistor in the circuit shown below

A) $V_0 = 6$ V
B) $V_0 = 66$ V
C) $V_0 = 72$ V
D) $V_0 = 78$ V
E) None of the above



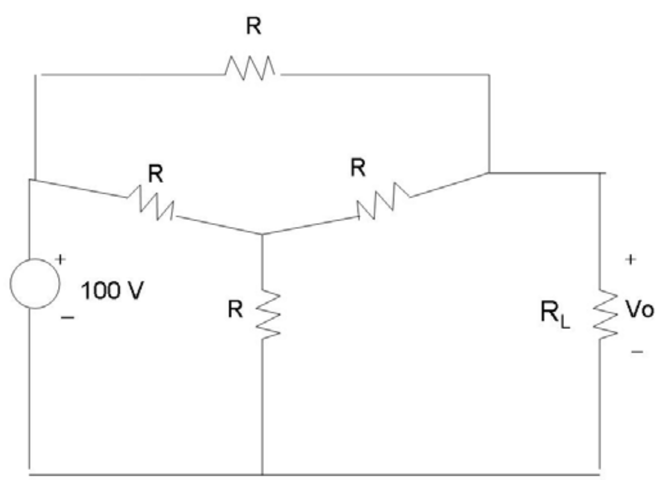
**Problem 4**




In the circuit shown, find the voltage denoted by Vs1

A) 300 V
B) 150 V
C) -150 V
D) 75 V
E) None of the above

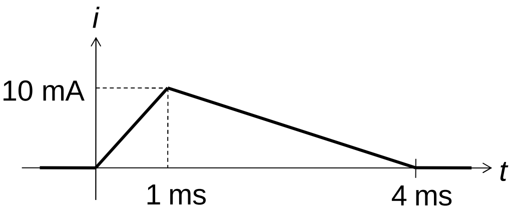
**Problem 5**




In the circuit shown above, find the value of the load resistance $R_L$ in terms of R such that Vo is 50 V.

A) R/3
B) 3R
C) R
D) 2R
E) None of the above

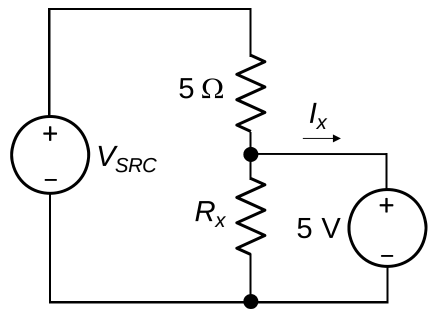
1. The current in a 1 μF capacitor is shown in the figure as a function of time. The total energy stored in μJ is:




   A. 40
   B. 100
   C. 200
   D. 50
   E. 25

**Solution:** $q$ at 4 ms is $\frac{10 \times 4}{2} = 20$ μC. The energy in μJ is $W = \frac{(20)^2}{2C} = \frac{200}{C}$, where $C$ is in μF.

2. If $V_{SRC}$ = 10 V, determine $R_x$ so that $I_x$ = 0.

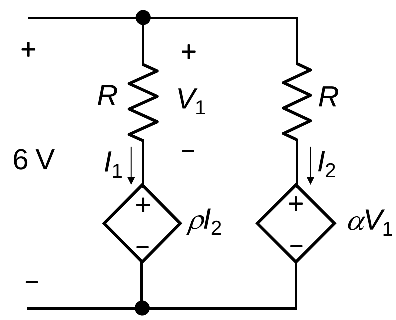



   A. 5 Ω
   B. 1.25 Ω
   C. 2.5 Ω
   D. 1 Ω
   E. 1.67 Ω

**Solution:** When $I_x$ = 0, $\frac{R_x}{R_x + 5} V_{SRC} = 5$, or

$$R_x = \frac{25}{V_{SRC} - 5}\ \Omega.$$

3. If $R$ = 10 Ω, determine the ratio $\rho / \alpha$ so that $I_1 = I_2$.

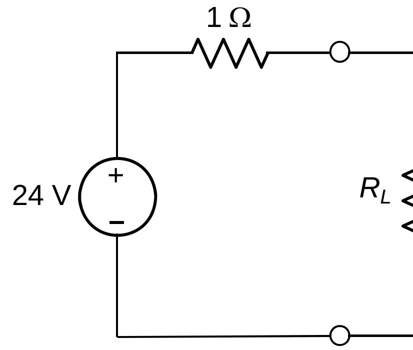



   A. 4 Ω
   B. 10 Ω
   C. 6 Ω
   D. 5 Ω
   E. 8 Ω

**Solution:** $I_1 = \frac{6 - \rho I_2}{R}$, $I_2 = \frac{6 - \alpha R I_1}{R}$, or

$\frac{6 - \rho I_1}{R} = \frac{6 - \alpha R I_1}{R}$, which gives $\rho / \alpha = R$.

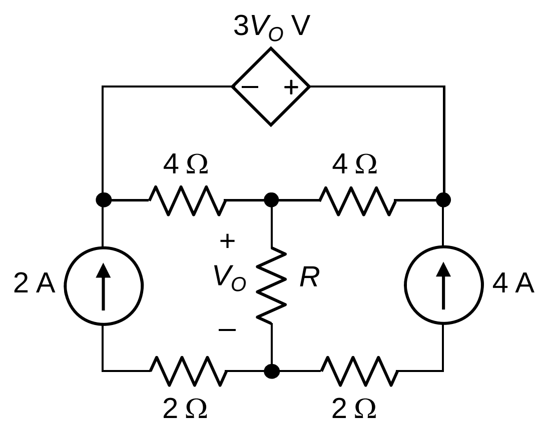
4. In the figure shown, the 24 V source having a source resistance of 1 Ω is replaced by the equivalent current source, the load resistance $R_L$ being the same. If $R_L$ = 5 Ω, the ratio of the power delivered by the **ideal** current source to the power delivered by the **ideal** 24 V source is:




   A. 5
   B. 11
   C. 7
   D. 14
   E. 9

**Solution:** The power delivered by the ideal voltage source is $24 \times \frac{24}{R_L + 1}$. The equivalent current source is an ideal current source of 24 A in parallel with 1 Ω. The power delivered by the current source is $24 \times 24 \frac{R_L \times 1}{R_L + 1}$. The ratio of the powers is numerically equal to $R_L$.

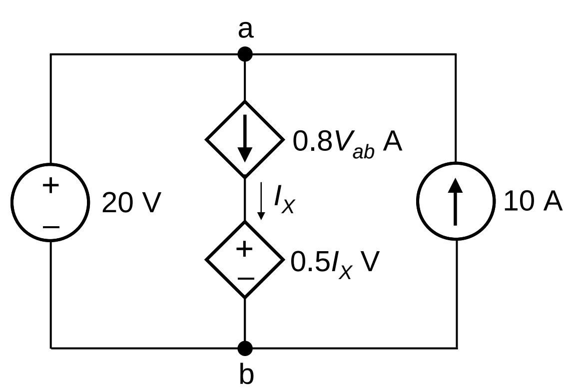
5. Determine $V_O$ in the circuit shown if $R$ = 1 Ω




   A. 18 V
   B. 12 V
   C. 30 V
   D. 6 V
   E. 24 V

**Solution:** The current through $R$ is 6 A, so that $V_O = 6R$.

6. Given the source connections shown. Determine the actual power delivered or absorbed by each source.




**Solution:** $I_X = 0.8 \times 20 = 16$ A. Current in 20 V source is 6 A in the direction of a voltage rise. Voltage across dependent voltage source is $0.5 \times 16 = 8$ V. Voltage across dependent current source is 20 – 8 = 12 V. It follows that:

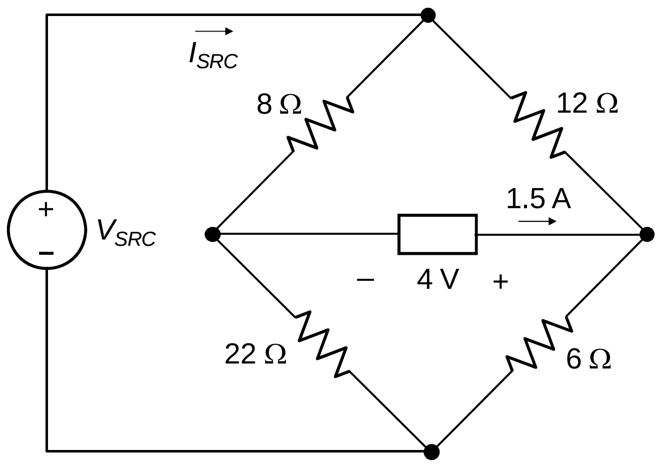
Power delivered by 20 V source is 20×6 = 120 W

Power delivered by 10 A source is 20×10 = 200 W

Power absorbed by dependent current source is 12×16 = 192 W

Power absorbed by dependent voltage source is 8×16 = 128 W

7. Determine $V_{SRC}$, $I_{SRC}$, and the voltages across the four resistors in the circuit shown. (Four grade points for each answer plus 1 bonus grade).

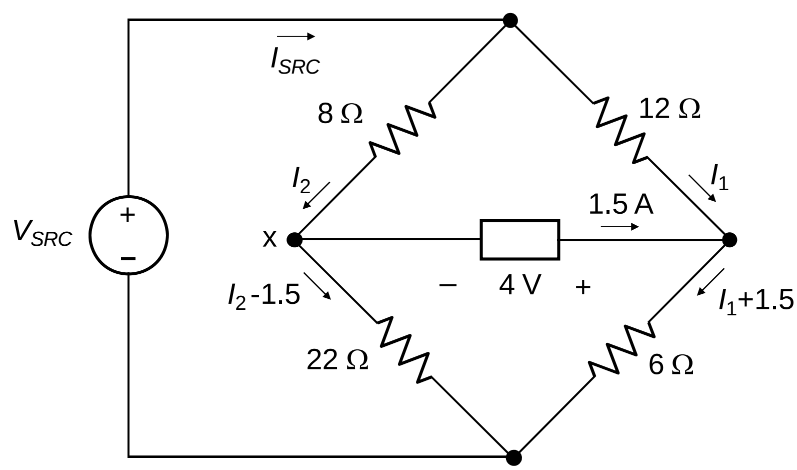



**Solution:** Going CCW around the upper mesh:

$4 + 12I_1 - 8I_2 = 0$

Going CW around the lower mesh:

$4 - 6(I_1 + 1.5) + 22(I_2 - 1.5) = 0$




The two equations reduce to:

$3I_1 - 2I_2 = -1$

$-3I_1 + 11I_2 = 19$

This gives: $I_1$ = 1 A; $I_2$ = 2 A. Hence,

Voltage across 12 Ω resistor: 12 V

Voltage across 6 Ω resistor: 15 V

Voltage across 8 Ω resistor: 16 V

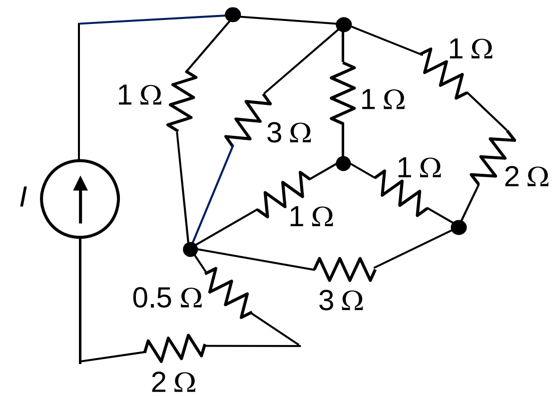
Voltage across 22 Ω resistor: 11 V

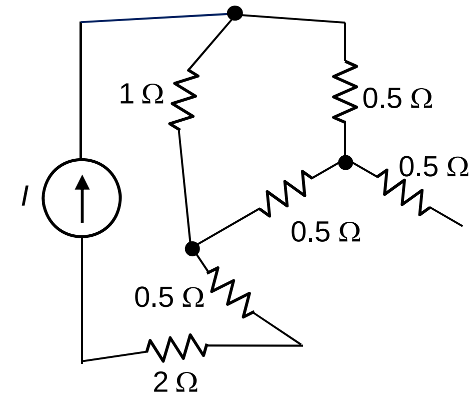
$V_{SRC}$ = 27 V

$I_{SRC}$ = 3 A.

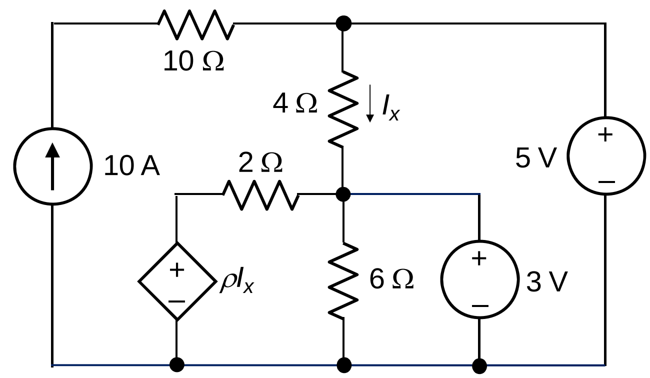
1. Determine the power dissipated in the circuit, assuming $I = 1$ A.

**Solution:** The 1 Ω Y is paralleled with a 3 Ω Δ, so that it effectively becomes a 0.5 Ω Y, and the circuit reduces to that shown. The resistance seen by the current source is $1||1 + 2.5 = 3$ Ω, so that the power dissipated in the circuit is $P = 3I^2$ W.



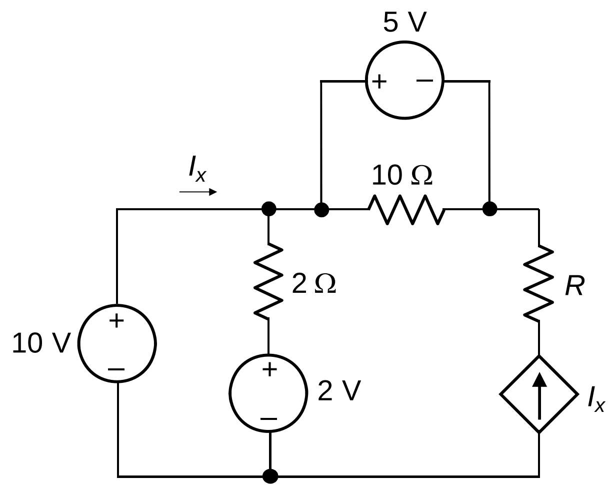




2. Determine the power delivered by the 3 V source, assuming $\rho = 2$ V/A.




**Solution:** The upper node is at 5 V with respect to the lowest node, the middle node is at 3 V. hence, $I_x = 0.5$ A and the current in the 6 Ω resistor is also 0.5 A. The current supplied by the 3 V source is $(3 – 0.5\rho)/2$ and the power delivered by the source is $P = 1.5(3 – 0.5\rho) = 4.5 – 0.75\rho$ W.

6. Determine the power absorbed or delivered by the dependent source assuming $R = 1$ Ω.

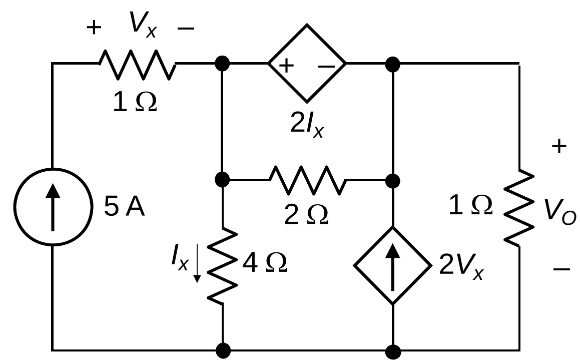


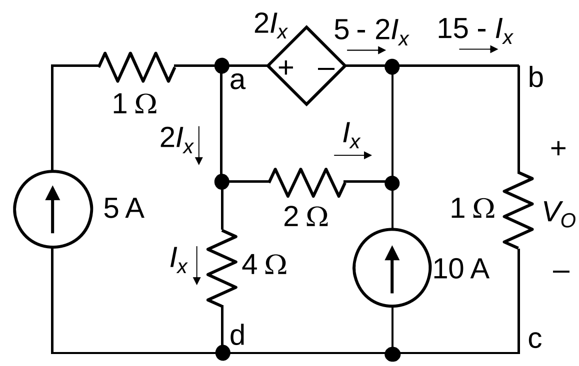

**Solution:** The current in the 2 Ω resistor is $2I_x$ flowing downwards. From KVL in the mesh on the left, $10 = 4I_x + 2$, or $I_x = 2$ A. The voltage rise $V_x$ across the dependent source is given by: $V_x – RI_x = 5$, or $V_x = 2R$

+ 5; The power $P$ delivered by the source is $P = 2(2\times R + 5)$.

16. Determine $V_O$.

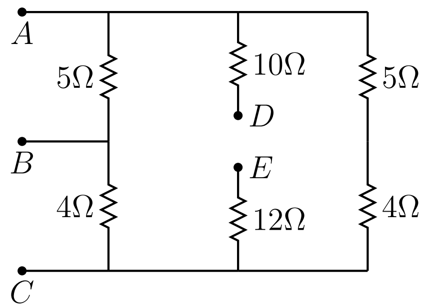
**Solution:** The $2V_x$ source is replaced by a 10 A source. The current in the 2 Ω resistor is $I_x$. The current in the dependent source is $5 - 2I_x$, so that the current in the 1 Ω resistor is $15 - I_x$. From KVL around the mesh abcd, $2I_x + 15 - I_x = 4I_x$, which gives $I_x = 5$ A. It follows that $V_O = 15 - I_x = 10$ V.



## Problem 1

Find the equivalent resistance between B and E.




A) 15.11Ω

B) 16Ω

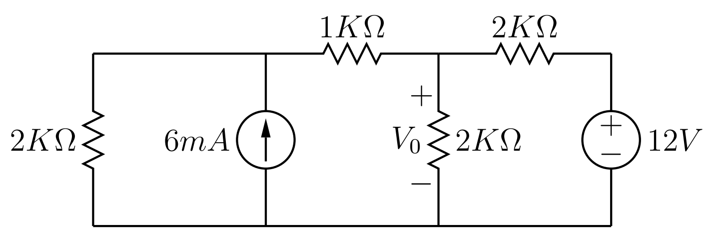
C) 8.33Ω

D) 13.61Ω

E) None of the above

## Problem 2

Find $V_0$.




A) 12V

B) 7.5V

C) -12V

D) -7.5V

E) None of the above