EE2210 Electric Circuits H.W.1 Ans.

1.

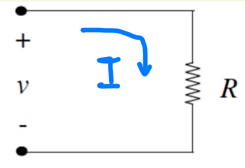


Figure 1.

$$V = 2V_0 \cos(wt)$$

$$I = \frac{2V_0}{R}\cos(wt)$$

$$P_{avg} = \frac{1}{T}\int_0^T \left[\frac{4V_0^2}{R}\cos^2(wt)\right]dt$$

$$= \frac{1}{T}\int_0^T \left[\frac{4V_0^2}{R}\cdot\frac{1+\cos(2wt)}{2}\right]dt = \frac{2V_0^2}{R} \#$$

2.

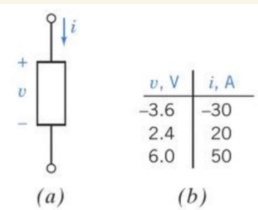


Figure 2.

2-(a)

V(V)	I(A)
−3.6	−30
2.4	20
6	50

$\text{slope} = \dfrac{2.4-(-3.6)}{20-(-30)} = 0.12 \ (V/A)$

$\text{slope} = \dfrac{6-2.4}{50-20} = 0.12 \ (V/A)$

$\Rightarrow$ I-V plot is a straight line with slope $= 0.12 \ (V/A)$, so this element is linear.

2-(b)

We can get I-V function from (a)

$\Rightarrow V = 0.12 I$

As $I = 40 \ mA$

$\Rightarrow V = 0.12 \times 40 \times 10^{-3} = 4.8 \ mV$ #

3.

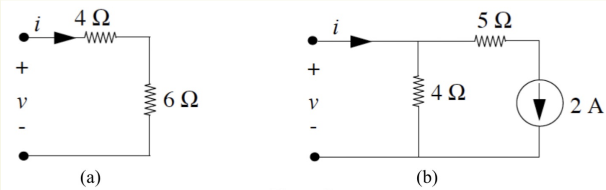
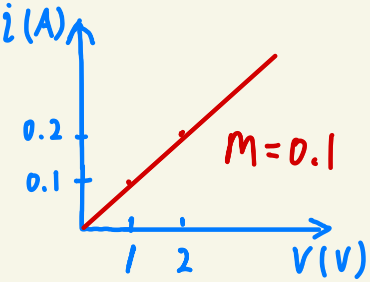
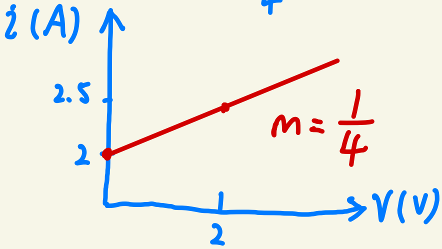


Figure 3.

(a) $V = i \times (4+6)$
$= 10 \cdot i$



(b)
$$\begin{cases} V=0,\ i=2 \\ V=1,\ i=2+\frac{1}{4} \\ V=2,\ i=2+\frac{2}{4} \end{cases} \Rightarrow i = \frac{1}{4}V + 2$$



4.

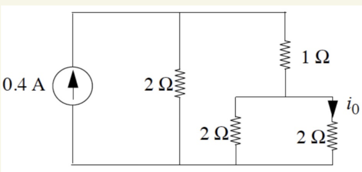
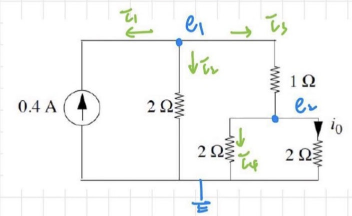


Figure 4.

4.



$i_0 = \frac{e_2}{2}$

KCL @ e_1 : $-0.4 + \frac{e_1}{2} + \frac{e_1 - e_2}{1} = 0$

KCL @ e_2 : $\frac{e_2 - e_1}{1} + \frac{e_2}{2} + \frac{e_2}{2} = 0$

$\Rightarrow \quad e_1 = 0.4V \ , \quad e_2 = 0.2V$

$\Rightarrow \quad i_0 = \frac{0.2}{2} = 0.1A$ #

5、

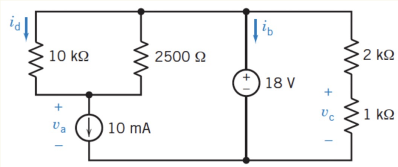
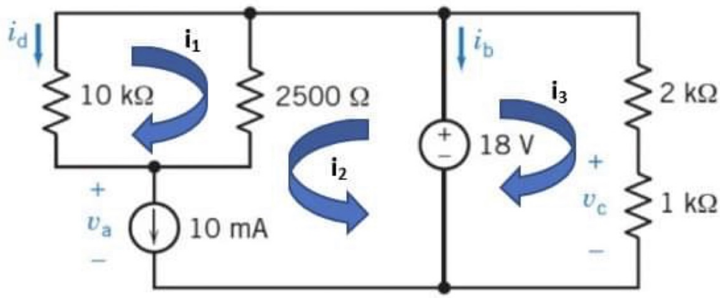


Figure 5.



(a)

Mesh1: $i_1 \times 10k+(i_1+i_2) \times 2500=0$

Mesh2: $i_2=10mA$

Mesh3: $18-i_3 \times 2k- i_3 \times 1k=0$

$i_1=-2mA, i_2=10mA, i_3=6mA$

$v_c= i_3 \times 1k=6m \times 1k=6V$

$v_a=18-(i_1+ i_2) \times 2500=18-(-2m+10m) \times 2500=-2V$

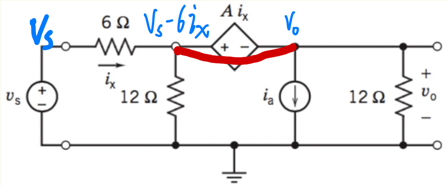
$i_b=-(i_2+ i_3)= -(10m+6m)=-16mA$

$i_d=-i_1=2mA$

(b)

The power supplied by the voltage source is $18 \times (- i_b)=18 \times 16mA=288mW$

6



$$\begin{cases} \dfrac{V_o}{12} + i_a + \dfrac{V_s - 6i_x}{12} - i_x = 0 \\ V_s - 6i_x = V_o + A i_x \end{cases}$$

$$\Rightarrow V_o = \frac{12-A}{A+24} V_s - \frac{12(A+6)}{A+24} i_a$$

題目給：$V_o = 2V_s + 9$

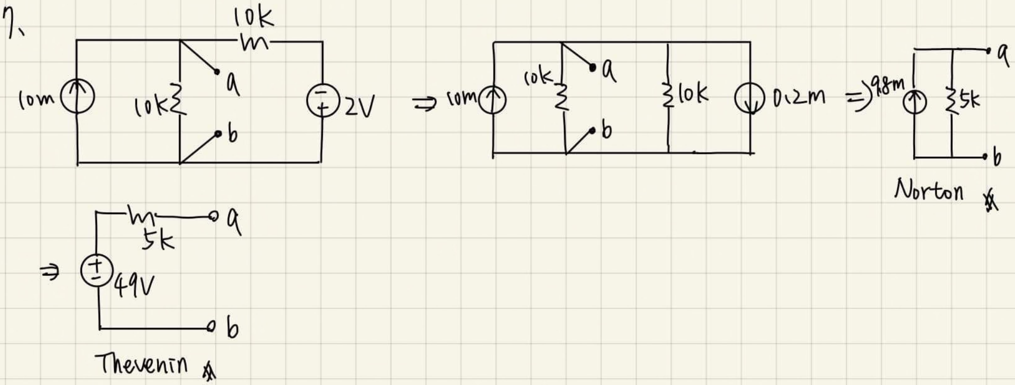
$$\therefore \frac{12-A}{A+24} = 2 \Rightarrow A = -12 \text{ ※}$$

$$\frac{-12(A+6)}{A+24} i_a = 9 \Rightarrow i_a = \frac{3}{2} A \text{ ※}$$

7.

HW1

7、



8.

8. Use superposition to find the voltage v in Figure 8. (10%)

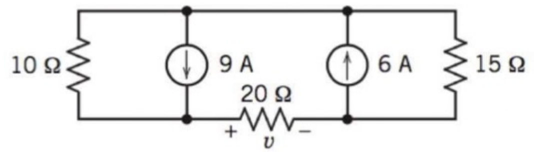
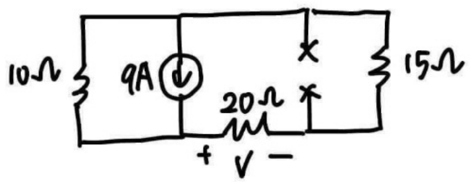


Figure 8.

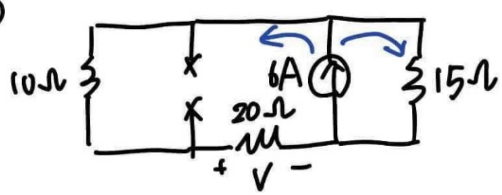
①



$V = 9\times\frac{10}{(20+15)+10} = 2A$

$V_1 = 20\times 2 = 40V$

②



$V = 6\times\frac{15}{(10+20)+15} = 2A$

$V_2 = 20\times 2 = 40V$

total $V = V_1 + V_2 = 80V$ #

9.

9. Determine the voltage v_5 in Figure 9. (8%)

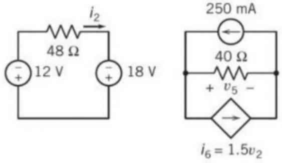
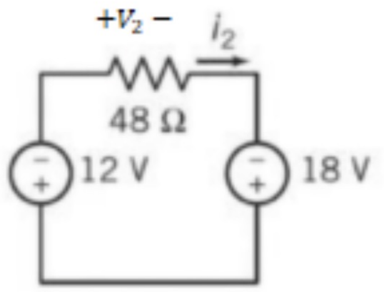
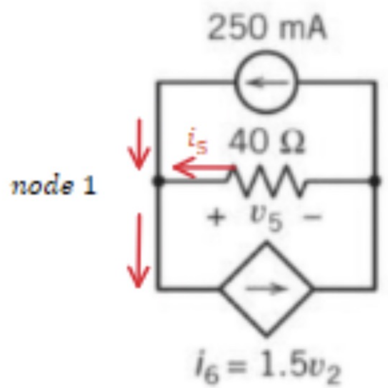


Figure 9.



$V_2 = -12\,V - (-18\,V) = 6\,V$

$\rightarrow i_6 = 1.5\,V_2 = 9\,A$



From node1,

Current in = Current out

$250\,mA + i_5 = i_6 = 9\,A$

$\rightarrow i_5 = 9\,A - 250\,mA = 8.75\,A$

$\rightarrow V_5 = R * I = 40 * 8.75 = 350\,V$

$V_5 = -350\,V$