

Homework I Ch. 1 # 13, 21, 24

Ch. 2 # 2, 5, 13, 14, 20, 28, 36

P. 1. 13

12-V battery w/output capacity of 100 ampere-hours.
When connected to a 200 watt lamp

a) find the current supplied by the battery

$$P = iV$$

$$P = 200 \text{ W}$$

$$V = 12 \text{ V}$$

$$i = \frac{P}{V}$$

$$= \frac{200 \text{ W}}{12 \text{ V}}$$

$$= \frac{50}{3} \text{ A} \approx 16.6 \text{ A}$$

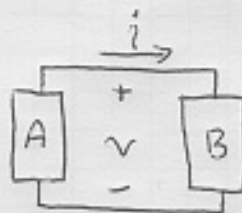
b) How long can the battery power the lamp?

$$t = (100 \text{ A}\cdot\text{h}) \left(\frac{3}{50} \text{ A}^{-1} \right)$$

$$t = 6 \text{ h}$$

P. 1. 21

Using the given reference marks, find the power transferred & whether the power is transferred from A to B or B to A.



a) Given $v = +33 \text{ V}$ and $i = -2.2 \text{ A}$
using passive sign convention for B

$$P = vi$$

$$= (33 \text{ V})(-2.2 \text{ A})$$

$$P = -72.6 \text{ W}$$

B to A

b) $v = -12 \text{ V}$, $i = -1.2 \text{ mA}$

$$P = (-12 \text{ V})(-1.2 \text{ mA}) = 14.4 \text{ mW}$$

A to B

c) $v = 37.5 \text{ V}$, $i = 40 \text{ mA}$

$$P = (37.5 \text{ V})(40 \text{ mA}) = 1.5 \text{ W}$$

A to B

d) $v = -15 \text{ V}$, $i = -43 \text{ mA}$

$$P = (-15 \text{ V})(-43 \text{ mA}) = 645 \text{ mW}$$

A to B

P.1.24 Given passive sign convention the voltage across a device is $v(t) = 5 \cos(10t)$ V & the current is $i(t) = 0.5 \sin(10t)$ A. Calculate power at $t = 0.2$ s & $t = 0.4$ s & state whether it is absorbing or delivering power.

@ $t = 0.2$ s

$$P = i v$$

$$P(t) = 2.5 \cos(10t) \sin(10t) \text{ W}$$

$$P(0.2) \approx -0.946 \text{ W} \quad \text{delivering power}$$

@ $t = 0.4$ s

$$P(0.4) \approx 1.24 \text{ W} \quad \text{absorbing power}$$

P.2.2

A $6.2 \text{ k}\Omega$ resistor dissipates 12 mW . Find current.

$$P = i^2 R$$

$$i = \sqrt{\frac{P}{R}}$$

$$= \sqrt{\frac{12 \text{ mW}}{6.2 \text{ k}\Omega}} = \sqrt{\frac{60}{31}} \text{ mA} \approx 1.39 \text{ mA}$$

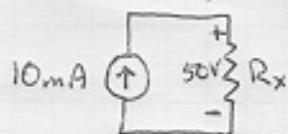
P.2.5

Find R_x .

$$v = i R$$

$$R_x = \frac{50 \text{ V}}{10 \text{ mA}}$$

$$R_x = 5 \text{ k}\Omega$$



$$P = v i$$

$$= (50 \text{ V})(10 \text{ mA})$$

$$P = 500 \text{ mW}$$

P.2.13 For circuit to the right

- a) Identify the nodes & at least three loops.

4 nodes A, B, C, D

Loops

ex.

1, 3, 2; 2, 4, 5; 3, 6, 4; 1, 5, 6; 2, 3, 6, 5

- b) Identify elements in series or in parallel.

None

- c) Write KCL & KVL eqns. for the circuit.

KCL

(A) $-i_2 - i_3 - i_4 = 0$

(B) $-i_1 + i_3 - i_6 = 0$

(C) $i_1 + i_2 + i_5 = 0$

(D) $i_4 - i_5 + i_6 = 0$

KVL

ex. loop 1, 3, 2 $-v_1 + v_2 - v_3 = 0$

loop 2, 4, 5 $-v_2 + v_4 + v_5 = 0$

loop 3, 6, 4 $v_3 - v_4 + v_6 = 0$

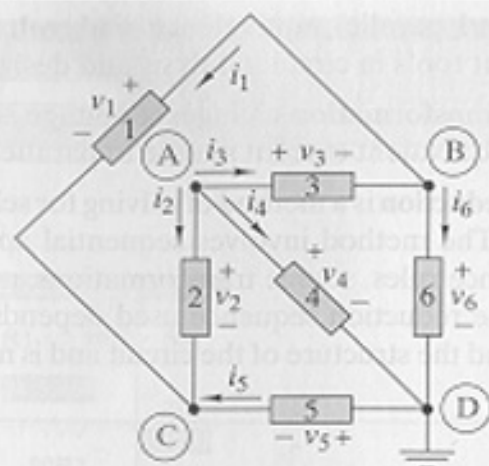


FIGURE P2-13

P.2.14

For the circuit in the previous problem

Find v_1 , v_5 , & v_6

Given $v_2 = 5V$

$v_3 = -8V$

$v_4 = 3V$

$$v_1 = v_2 - v_3 = 13V$$

$$v_5 = v_2 - v_4 = 2V$$

$$v_6 = v_4 - v_3 = 11V$$

P.2.20

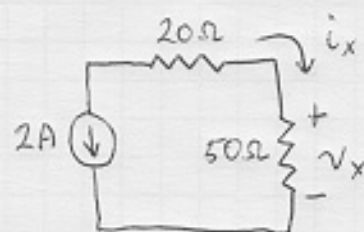
Find v_x & i_x

$$i_x = -2A$$

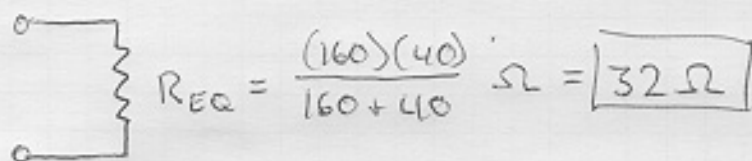
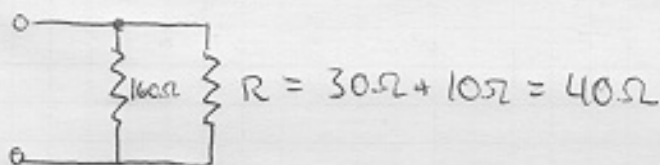
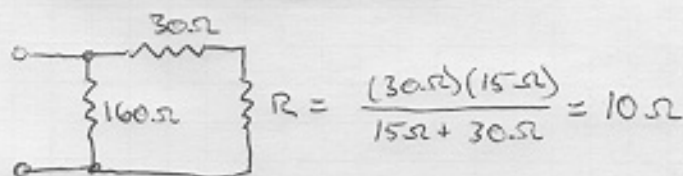
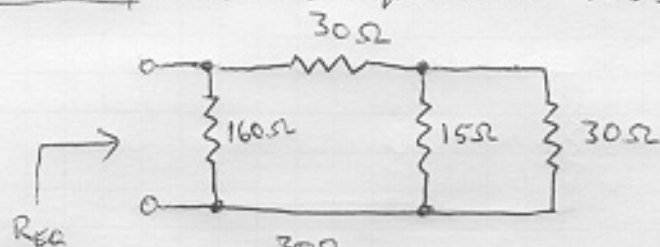
$$v_x = i_x R_v$$

$$= (-2A)(50\Omega)$$

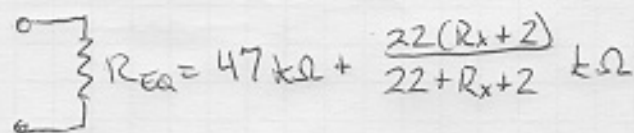
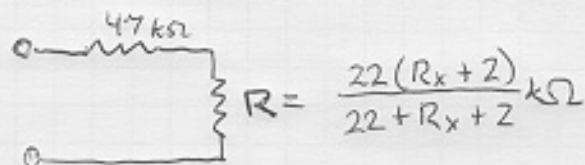
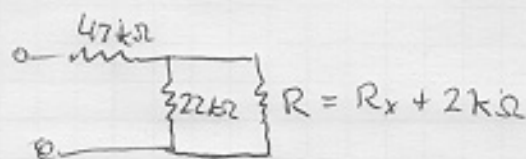
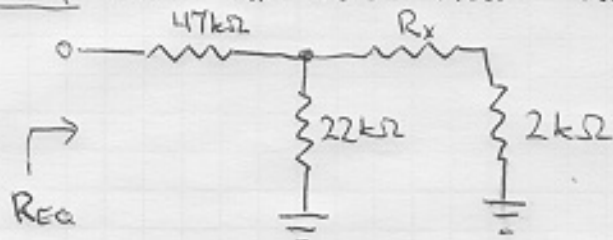
$$v_x = -100V$$



P.2.28 Find the equivalent resistance R_{eq}



P.2.36 Find R_x such that $R_{eq} = 60 k\Omega$



Set $R_{eq} = 60 k\Omega$

$$60 k\Omega = 47 k\Omega + \frac{22(R_x + 2)}{22 + R_x + 2} k\Omega$$

solve for R_x

$$R_x = \frac{(60 - 47)(22 + 2) - (22)(2)}{22 + 47 - 60} k\Omega$$

$$R_x = \frac{268}{9} k\Omega \approx 29.7 k\Omega$$