Homework Solutions -1

Solution 1.18

$p_1 = 30(-10) = \mathbf{-300\ W}$
$p_2 = 10(10) = \mathbf{100\ W}$
$p_3 = 20(14) = \mathbf{280\ W}$
$p_4 = 8(-4) = \mathbf{-32\ W}$
$p_5 = 12(-4) = \mathbf{-48\ W}$

Solution 1.20

$p_{30\text{ volt source}} = 30x(-6) = \mathbf{-180\ W}$
$p_{12\text{ volt element}} = 12x6 = \mathbf{72\ W}$
$p_{28\text{ volt e.ement with 2 amps flowing through it}} = 28x2 = \mathbf{56\ W}$
$p_{28\text{ volt element with 1 amp flowing through it}} = 28x1 = \mathbf{28\ W}$
$p_{\text{the 5Io dependent source}} = 5x2x(-3) = \mathbf{-30\ W}$

Since the total power absorbed by all the elements in the circuit must equal zero, or $0 = -180+72+56+28-30+p_{\text{into the element with Vo}}$ or

$p_{\text{into the element with Vo}} = 180-72-56-28+30 = \mathbf{54\ W}$

Since $p_{\text{into the element with Vo}} = V_o x3 = 54$ W or $V_o = \mathbf{18\ V}$.

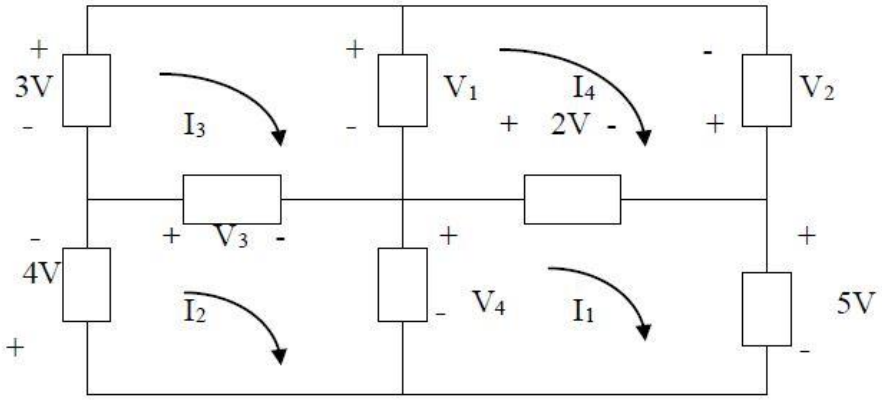
Solution 1.26

(a) Clearly 10.78 watt-hours = (voltage)(current)(time) = 3.85I(3) or I = 10.78/[(3.85)(3)] = **933.3 mA**

(b) p = energy/time = 10.78/3 = **3.593 W**

(c) amp-hours = energy/voltage = 10.78/3.85 = **2.8 amp-hours**

Solution 2.14



For mesh 1,

$-V_4 + 2 + 5 = 0 \longrightarrow V_4 = 7V$

For mesh 2,

$+4 + V_3 + V_4 = 0 \longrightarrow V_3 = -4 - 7 = -11V$

For mesh 3,

$-3 + V_1 - V_3 = 0 \longrightarrow V_1 = V_3 + 3 = -8V$

For mesh 4,

$-V_1 - V_2 - 2 = 0 \longrightarrow V_2 = -V_1 - 2 = 6V$

Thus,

$V_1 = -8V, \quad V_2 = 6V, \quad V_3 = -11V, \quad V_4 = 7V$

Solution 2.15

Calculate v and i_x in the circuit of Fig. 2.79.

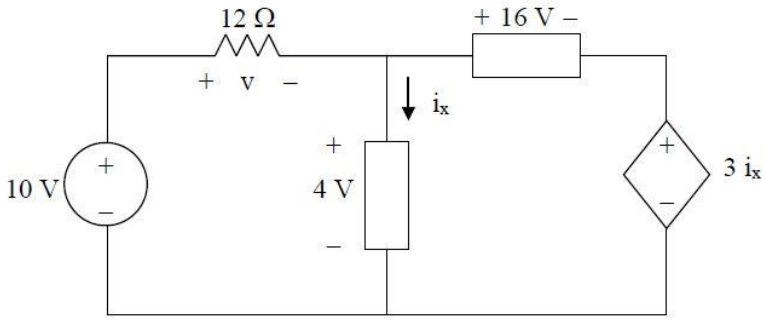


Figure 2.79
For Prob. 2.15.

Solution

For loop 1, $-10 + v + 4 = 0$, $v = \mathbf{6\ V}$

For loop 2, $-4 + 16 + 3i_x = 0$, $i_x =$ **–4 A**

Applying KVL around the entire outside loop we get,

–24 + v1 + 10 + 12 = 0 or v1 = **2V**

Applying KVL around the loop containing v2, the 10-volt source, and the 12-volt source we get,

v2 + 10 + 12 = 0 or v2 = **–22V**

Applying KVL around the loop containing v3 and the 10-volt source we get,

–v3 + 10 = 0 or v3 = **10V**