ENGR 210
FALL 2003
HOMEWORK #1
SOLUTIONS

1-2) a) 22 mV
b) 23 nF
c) 56 kΩ
d) 752 kJ or 0.752 MJ
e) 235 μH or 0.235 mH

$p = v \cdot i$

1-21) a) (-) 72.6 W from B to A
b) 14.4 mW " A " B
c) 1.5 W " A " B
d) 645 mW " A " B

1-28) a) to recharge, requires $75A \cdot 6h = 450A \cdot h$

$$\text{efficency} = \frac{\text{output}}{\text{input}} = \boxed{88.9\%}$$

b) $w = \int p\,dt = \int v \cdot i\,dt$

v & i constant ($v = 24V$, $i = 75A$), so

$= v \cdot i \cdot \Delta t$ (need Δt in seconds!)

$= 24V \cdot 75A \cdot 6h \cdot \frac{60 \text{ min.}}{1 \text{ hr.}} \cdot \frac{60 \text{ s.}}{1 \text{ min.}}$

$= \boxed{38.88 \text{ MJ}}$

4
2-10) Ohm's Law:

$v = i \cdot R$

Given:

$R = 0.3 T_c + 100$

$i = 1\,mA$

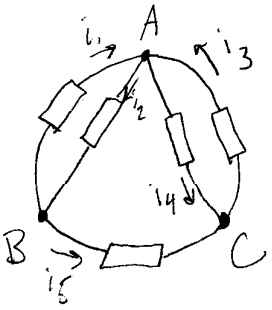
$T_c = 400°C$

$= 1\,mA \cdot (0.3 \cdot 400 + 100)\,\Omega$

$= (120 + 100)\,mV$

$= \boxed{220\,mV \text{ or } 0.22\,V}$

6
2-17)



Given: $i_1 = 2\,A$

$i_2 = -5\,A$

$i_3 = 4\,A$

KCL at node B:

$-i_1 + i_2 - i_5 = 0$

$i_5 = i_2 - i_1$

$= -5A - 2A$

$\boxed{i_5 = -7A}$

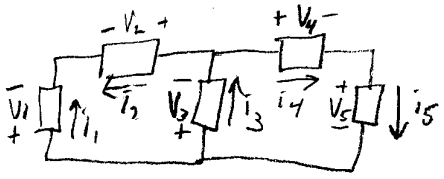
KCL at node C:

$-i_3 + i_4 + i_5 = 0$

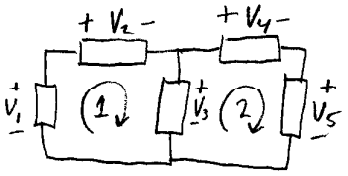
$i_4 = i_3 - i_5$

$= 4A - (-7A)$

$\boxed{i_4 = 11A}$

2-18) 

one other possibility:
reverse ALL voltage signs AND ALL current directions

2-16) 

Given: $V_1 = 5\,V$
$V_3 = -10\,V$
$V_4 = 10\,V$

KVL around loop 1

$-V_1 + V_2 + V_3 = 0$

$V_2 = V_1 - V_3$

$= 5V - (-10V)$

$\boxed{V_2 = 15\,V}$

KVL around loop 2

$-V_3 + V_4 + V_5 = 0$

$V_5 = V_3 - V_4$

$= -10V - 10\,V$

$\boxed{V_5 = -20\,V}$