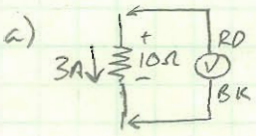
5(1, 7, 18abcdefg, 21a, 22b)

5-1

READ: READING OF EACH METER

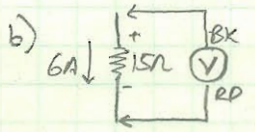
SOLN:

a)



$V = IR = 3A(10\Omega) = \boxed{+30V = V}$

b)

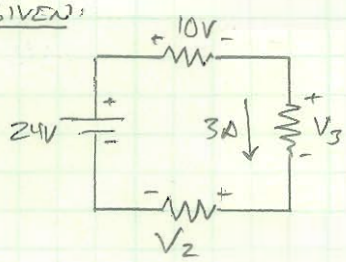


$V = IR = -6A(15\Omega) = \boxed{-90V = V}$

(-) BECAUSE LEAD REVERSAL [RD → (-) & BK → (+)]

5-7

GIVEN:



$P_3 = 36W$

READ: V_2 & V_3

SOLN:

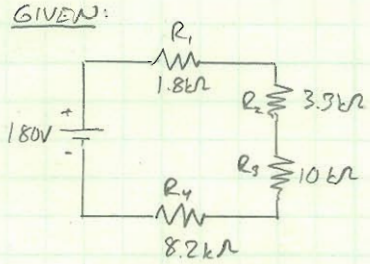
$P_3 = IV_3 \rightarrow V_3 = \frac{P_3}{I} = \frac{36W}{3A} = \boxed{12V = V_3}$

$\circlearrowleft$ KVL $\rightarrow \Sigma V = 0 \rightarrow +24V - 10V - 12V - V_2 = 0$

$V_2 = 24V - 10V - 12V = \boxed{2V = V_2}$

18abcdefg

GIVEN:



READ: R_T, I, $V_1/V_2/V_3/V_4$, VERIFY KVL, $P_1/P_2/P_3/P_4$, VERIFY $P_{IN} = P_{TOT}$

SOLN:

(a) $R_T = 1.8\text{k}\Omega + 3.3\text{k}\Omega + 10\text{k}\Omega + 8.2\text{k}\Omega = \boxed{23.3\text{k}\Omega = R_T}$

(b) $I = \frac{E}{R_{TOT}} = \left(\frac{180\text{V}}{23300\,\Omega}\right) = \boxed{7.73\text{ mA} = I}$

(c) $V_1 = IR_1 = (7.73\text{ mA})(1.8\text{ k}\Omega) = \boxed{13.9\text{V} = V_1}$

$V_2 = IR_2 = (7.73\text{ mA})(3.3\text{ k}\Omega) = \boxed{25.5\text{V} = V_2}$

$V_3 = IR_3 = (7.73\text{ mA})(10\text{ k}\Omega) = \boxed{77.3\text{V} = V_3}$

$V_4 = IR_4 = (7.73\text{ mA})(8.2\text{ k}\Omega) = \boxed{63.3\text{V} = V_4}$

(d) VERIFY KVL

$\Sigma V = 0 \rightarrow 180\text{V} - 13.9\text{V} - 25.5\text{V} - 77.3\text{V} - 63.3\text{V} = 0$ ✓

(e) $P_1 = I^2R_1 = (0.0773\text{A})^2\,1800\,\Omega = 0.107\text{W} = \boxed{107\text{ mW} = P_1}$

$P_2 = I^2R_2 = (0.0773\text{A})^2\,3300\,\Omega = 0.197\text{W} = \boxed{197\text{ mW} = P_2}$

$P_3 = I^2R_3 = (0.0773\text{A})^2\,10000\,\Omega = 0.597\text{W} = \boxed{597\text{ mW} = P_3}$

$P_4 = I^2R_4 = (0.0773\text{A})^2\,8200\,\Omega = 0.489\text{W} = \boxed{489\text{ mW} = P_4}$

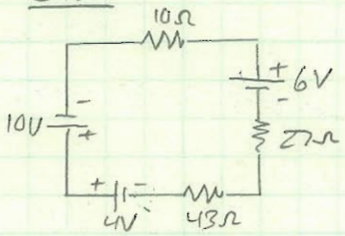
(f) $P_{IN} = IV = (0.0773\text{A})\,180\text{V} = 1.39\text{W}$

$P_{TOT} = 0.107 + 0.197 + 0.597 + 0.489 = 1.39\text{W}$

$\Big\}\ P_{IN} = P_{TOT}$ ✓

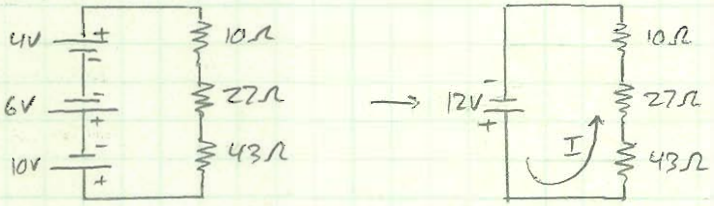
S-21a

GIVEN:



READ: SIMPLIFY TO SINGLE VOLTAGE SRC. FIND I.

SOLN:



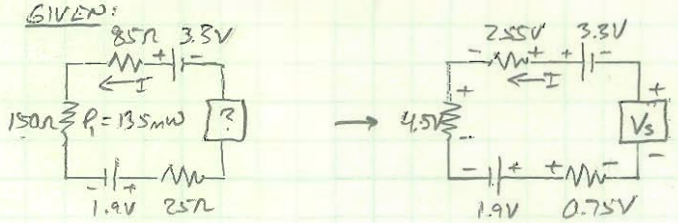
$E_{TOT} = -10V - 6V + 4V = -12V$

$R_{TOT} = 10 + 27 + 43 = 80\Omega$

$I = \frac{E}{R_{TOT}} = \frac{12V}{80\Omega} = 0.15A = \boxed{150\ mA = I}$

S-22b

GIVEN:



READ: POLARITY & MAGNITUDE OF UNKNOWN VOLTAGE SRC.

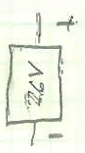
SOLN:

$P_1 = I^2R_1 \rightarrow I = \sqrt{\frac{P_1}{R_1}} = \sqrt{\frac{0.135W}{150\Omega}} = 0.03A = \underline{30\ mA = I}$

$V_1 = IR_1 = 0.03A\,(150\Omega) = 4.5V$

$V_2 = IR_2 = 0.03A\,(85\Omega) = 2.55V$

$V_3 = IR_3 = 0.03A\,(25\Omega) = 0.75V$



$\circlearrowright$ KVL $\rightarrow +1.9V - 0.75V + V_s + 3.3V - 2.55V - 4.5V = 0 \rightarrow \boxed{V_s = 2.6V}$