NAME (printed): * SOLUTIONS *

- **All 5 questions are equally weighted**
- **Partial credit may be given on problems 1 and 2 only – show your work!**
- **Box-in your final answer for each problem**

1) Find the conductance of 400 feet of #16 AWG wire made of copper at 20 Deg C:

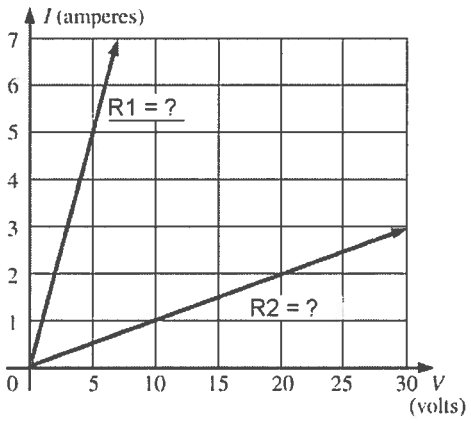
→ 2581 CM

$G = \frac{1}{R}$

$R = \rho \frac{\ell}{A} = \left(10.37 \frac{CM\,\Omega}{ft}\right)\left(\frac{400\,ft}{2581\,CM}\right) = 1.607\,\Omega$

$\therefore G = \frac{1}{1.607\,\Omega} = \boxed{0.622\,S}$

2) Find the resistance values R1 and R2 given the following I-V curves:



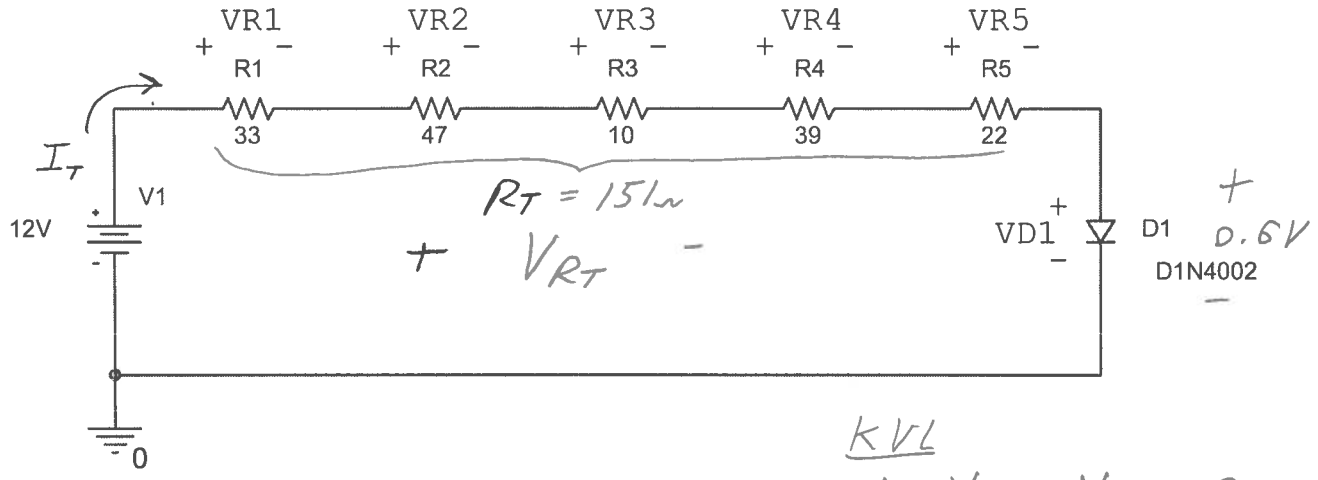
$R_1 = \frac{5V}{5A} = \boxed{1\,\Omega}$

$R_2 = \frac{20V}{2A} = \boxed{10\,\Omega}$

Problems 3 through 5 on the back →

Problems 3 through 5 refer to the following circuit:

- Assume V_{D1} = 0.6 V for all three problems



KVL

$V_1 - V_{R_T} - V_{D1} = 0$

$\therefore V_{R_T} = 12V - 0.6V$

$= 11.4V$

$I_T = \frac{V_{RT}}{R_T} = \frac{11.4V}{151\Omega}$

$I_T = 75.497mA$

3) What is the current value and direction flowing in the circuit?

a. 75.5 mA, left to right through the resistors

b. 74.7 mA, ~~right to left~~ through the resistors

c. 71.8 mA, left to right through the resistors

d. 74.1 mA, ~~right to left~~ through the resistors

4) How much power is dissipated by resistor R3?

a. 3.91 mW

b. 52.4 mW

c. 57.0 mW

d. 45.3 mW

$P_{R_3} = I_T^2 R_3 = 56.998mW$

5) What is the voltage across R_1, V_{R1}?

a. 0.71 V

b. -0.62 V

c. 3.55 V

d. 2.49 V

$V_{R_1} = (I_T)(R_1)$

$= 2.491V$

Material	*Rho (ρ)* CM Ω/ft @ 20° C
Silver	9.9
Copper	**10.37**
Gold	14.7
Aluminum	17.0
Tungsten	33.0
Nickel	47.0
Iron	74.0
Constantan	295.0
Nichrome	600.0

Material	T_{ABS} (°C)
Silver	-234.0
Copper	-234.5
Gold	-274
Aluminum	-236
Tungsten	-204
Nickel	-147
Iron	-162
Nichrome	-2,250
Constantan	-125,000

$$\frac{|T_{ABS}| + T_1}{R_1} = \frac{|T_{ABS}| + T_2}{R_2}$$

American Wire Gage (AWG) Sizes – Copper

Gauge (AWG)	Area (CM)	Ohms/1000 ft	Maximum amps
6	26244	0.3951	101
7	20822	0.4982	89
8	16512	0.6282	73
9	13087	0.7921	64
10	10384	0.9989	55
11	8226	1.26	47
12	6529	1.588	41
13	5184	2.003	35
14	4109	2.525	32
15	3260	3.184	28
16	2581	4.016	22
17	2052	5.064	19
18	1624	6.385	16