Name: _____

Basic DC Lab - ELEC 101L

LAB #6: Power In DC Circuits

In this lab, power in electrical circuits will be explored. Power consumption is an important concept when performing circuit analysis or design. Learning how to select the proper resistor using its power rating for circuit application is critical for electrical design. If the power of the application exceeds the power rating of the resistor, the resistor will get very hot and more than likely burn out. To avoid this situation the power rating for the resistor must be properly sized to withstand the heating from current.

Power Equations: [P] = Watts (W) $P = IV$ $P = V^2/R$ $P = I^2R$

Common Resistor Power Ratings: 1/8 (0.125)W, 1/4 (0.25)W, 1/2 (0.5)W, 1W, and 2W

Determining the Power Rating:
A current of 20 mA and a voltage of 7 V will yield a power of 140 mW. 140 mW is equal to 0.14 W, which is less than 0.25 W, so a resistor with 1/4W rating would be appropriate for the application.
OR
I = 20 mA, V = 7 V, P = 140 mW = 0.14 W
0.14 W > 0.125 (1/8) W, but 0.14 W < 0.25 (1/4) W, so a resistor with a 1/4 W rating should be used, not 1/8W or 1/2W, etc.

Complete part I outside the lab and complete parts III and IV in the lab.

PART I
Given Current and Voltage, find Power and proper Power Rating. (2 pts ea.)

1) I = 3 mA, V = 5 V, P = _____ Power Rating = _____
2) I = 2.3 A, V = 20 V, P = _____ Power Rating = _____
3) I = 82 mA, V = 14.5 V, P = _____ Power Rating = _____

Given Voltage and Resistance, find the Power. (2 pts ea.)

1) V = 2.4 V, R = 470 Ω, P = _____ Power Rating = _____
2) V = 9.8 V, R = 56 kΩ, P = _____ Power Rating = _____
3) V = 1 V, R = 68 Ω, P = _____ Power Rating = _____

Given Current and Resistance, find the Power. (2 pts ea.)

1) I = 3.3 mA, R = 2 kΩ, P = _____ Power Rating = _____
2) I = 1.5 A, R = 470 Ω, P = _____ Power Rating = _____
3) I = 9 mA, R = 5.6 kΩ, P = _____ Power Rating = _____

PART II

Now that you have a good idea on how to select the correct resistor for the proposed application, you will use this knowledge to select the proper component on the following design problem.

A one resistor circuit is to have 9.4 mA flowing through it and use a voltage of 15 V. What resistor is needed and what is the power rating needed for the circuit to meet the given criterion? (*Use a Standard Value Resistor*). Please **show all work** and write answers in the spaces provided. Also, draw the circuit in the box below.
(15 pts)

Resistor needed: _____

Calculated Power = _____

Power Rating Required: _____

PART III

Construct the circuit that you designed in PART II. (10 pts) Using the Digital Multimeter, make the measurements on the voltage of the circuit and the current through the circuit. Also use the Digital Multimeter to measure the resistor. Write the values in the spaces provided below. (5 pts ea.)

Voltage = _____ Current = _____ Resistance = _____

Using your measurements, calculate the measured Power. (3 pts) P = IV = _____

Does the measured power reflect the calculated power? Why? (3 pts)

What is the actual tolerance of the measured power value with respect to the calculated value? What makes the measured power different from the calculated power? (6 pts)

QUESTIONS

When answering the questions, be sure to answer in **complete sentences** and as diligently as you possibly can. You will be graded on completeness and conciseness.

1) What is the objective of this lab? Be specific. (3 pts)

2) State why the concept of power is important to circuit analysis? Be specific. (3 pts)

3) What would happen if an 1/8 W resistor were used in a circuit having 10V and 30mA? Show your calculations. (6 pts)