EE 302, Introduction to Electrical and Computer Engineering

Dr. Archie Holmes, Jr.

Exam #2

Name: _____

SSN: _____

Please remember….

- **Read the entire exam before starting**
- **If you feel you need more information than is given, please ask!!!**
- **Show all work for credit!!!**
- **Relax!!!**

This exam contains 10 pages and 4 problems along with some extra credit questions
Give units to all answers where applicable

Problem #1	_____
Problem #2	_____
Problem #3	_____
Problem #4	_____
Bonus (Extra Credit)	_____
Total	_____

This information will be provided when I return the exam

Class Average = _____

Standard Deviation = _____

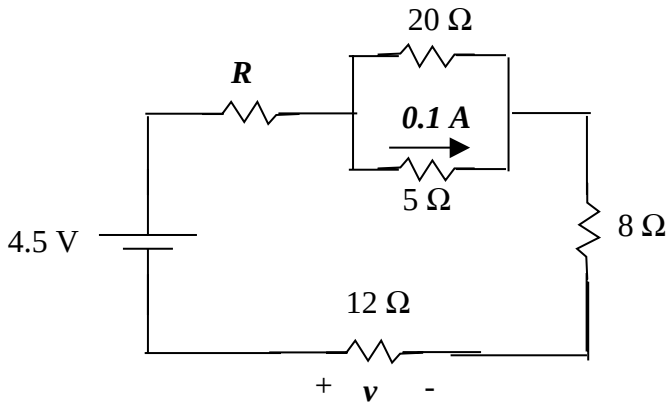
PROBLEM #1. OHM'S LAW, KVL, KCL, AND CURRENT (15 POINTS)

a) Provide **brief** definitions for KVL, KCL, and Ohm's Law

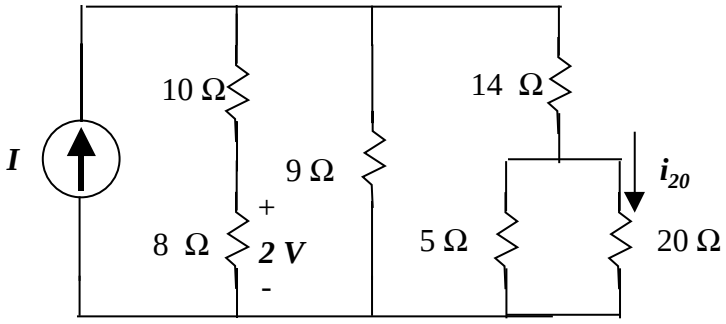
b) Calculate the power delivered by a 5-V voltage source when $9.5 \cdot 10^{17}$ electrons are flowing **into the negative terminal** every 5 seconds. The magnitude of the charge of an electron is $1.602 \cdot 10^{-19}$C.

PROBLEM #2: VOLTAGE AND CURRENT DIVISION (30 POINTS)

Solve for the unknown values in the circuit below by any method taught in class. **Show work for full credit!!** Use the additional page as needed.

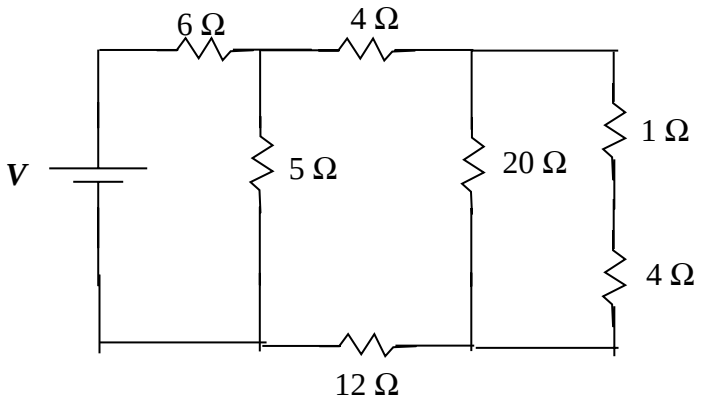


v = _____ V R = _____ Ω



I = _____ A i_{20} = _____ A

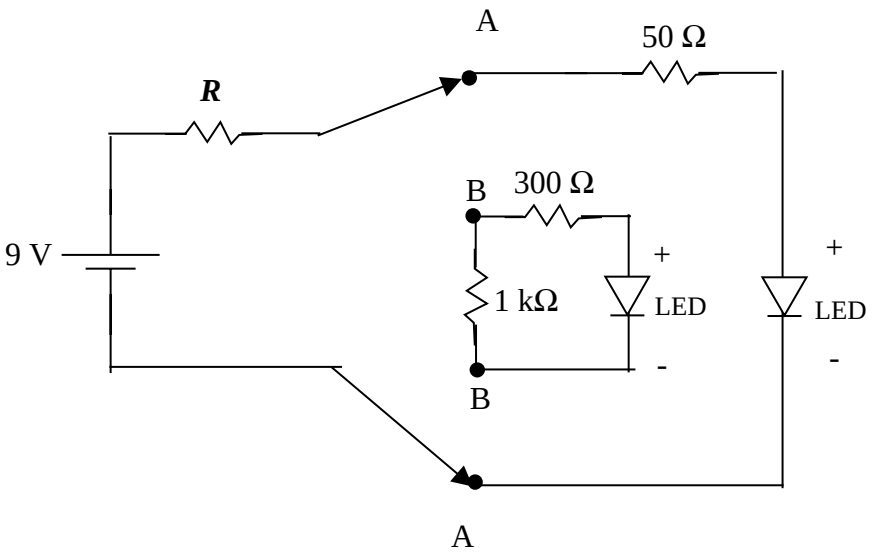
PROBLEM #3. POWER IN ELECTRICAL CIRCUITS (25 POINTS)



a) Calculate the equivalent resistance (R_{eq}) of the circuit
b) Calculate the value of the voltage source if 240 mW of power is absorbed by the 6 Ω resistor.
c) Calculate the power dissipated (absorbed) by the 12 Ω resistor

PROBLEM #4. LIGHT-EMITTING DIODE (LED) CIRCUIT DESIGN (30 POINTS)

You have just been hired by the Holmes Lighting Company. Your first project is to finish the design of a two-LED flashlight which was left by a fellow employee. The circuit is shown below.



The parameters you have to make sure are satisfied are listed below:

- When the circuit is in position *A* (bright mode), the LED must receive between 40 and 80 mA of current.
- When the circuit is in position *B* (normal mode), the LED must receive between 10 and 20 mA of current.

a) Pick a value for the resistor ***R*** which satisfies both of these conditions. Assume that the LED each have a voltage drop of 0.7 V across them when in operation. Show your work for full credit!! *Hint:* There will be more than one value which can be used to make these conditions true and consider each case as a separate, independent circuit.

b) Pick the value of ***R*** (whole number value only) which leads to the most current being delivered . How much power is being dissipated by each LED in this case? *Hint:* Will both of them be able to receive the maximum current?

BONUS SECTION (3 POINTS)

1) "Who" was the winner of this year's Nobel Peace Prize?

2) What major treaty was defeated in the Senate last week?

3) What nuclear country recently had its democratically-elected government toppled by a military coup?

4) A number of countries have experienced devastating earthquakes in the last month (two months, etc). Name two (three) of them, other than the United States.