

Physics 203

Week 09 quiz | Ecampus

5/26/2021

Collaboration is not allowed. You will have 25 minutes to download this PDF, solve, take pictures, AND upload this exam to Gradescope. You will have an additional 5 minute buffer in case technological issues arise.

Consider the circuit with constant voltage sources and resistors only. In the parts below, you will not need to solve for any unknown values. You will need to answer the questions that may involve writing algebraic expressions.

(a) How many unique values of current (i.e. how many unknowns) are there in this circuit? Clearly label each current on the circuit with a unique variable (e.g. I_1, I_2 , etc...) and be sure to indicate your choice for current direction. You will not be graded on choice of current direction, but make sure to be consistent with your choices when answering parts (b) and (c).

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(b) Write out the equations for current at each junction consistent with your choice of current directions from part (a)

(A) $I_1 = I_2 + I_3$

(B) $I_2 + I_3 = I_4 + I_5$

(C) $I_4 + I_5 = I_1$

(c) Identify the minimum number of voltage loops required to account for each circuit element. For each loop, create an expression that could be used in addition to the junction equations in part (b) to solve for the unknown currents. Remember, you do not have to solve for the currents, simply produce a set of equations that could be used to solve for the unknown currents. Label each loop and direction on the diagram so that each loop equation can be identified on your circuit clearly.

E

$$9 - 3I_3 + 2I_2 = 0$$

F

$$6 - I_1 - 2I_2 - 5I_5 = 0$$

G

$$7 + 5I_5 - 4I_4 = 0$$

WOULD NEED THESE 3 EQUATIONS

**** NOTE **** You can also cover all circuit elements with just two loops. One that goes around the outside and another that is just the bottom left loop.

Rubric

~~ Part (a) ~~
 1 pt - correct # currents
 1.5 pts - labeling

~~ Part (b) ~~
 3 pts - current equations

~~ Part (c) ~~
 1 pt - Identifying a loop
 1 pt - Ohm's law
 2.5 pts - Application of loop rule

