DLS/Stevenson East Side Science Olympiad Invitational

Saturday, January 26, 2013

Circuit Lab – Written Test

Team Number: _____ Team Name: _____

Team Members: _____

1. Please record your answers in the space provided. If you fail to record an answer, you will not get any credit for that question.
2. There is no penalty for wrong answers EXCEPT for breaking ties.
3. You may separate the pages but they ALL must be re-stapled in the correct order at end of the test.
4. You have 25 minutes to solve this test, no more.
5. Return the complete exam after you are done. Failing to do so will disqualify you from the event.

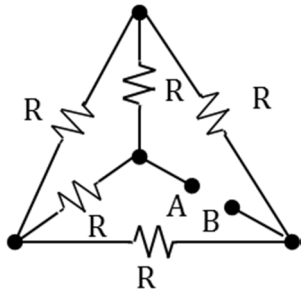
DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO!

Score: _____ Rank: _____

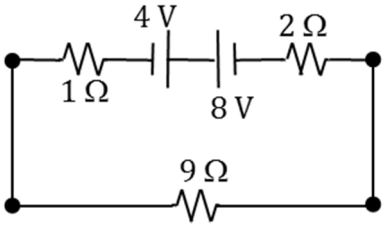
1. The resistance of an ammeter is 13 Ω and its scale is graduated for a current up to 100A. After an additional shunt has been connected to this ammeter it becomes possible to measure up to 750 A by this meter. The value of shunt resistance is
   a. 20.0 Ω
   b. 0.2 Ω
   c. 2.0 Ω
   d. 2.0 k Ω

   A shunt (resistor) bypasses the excess current to keep the amperage of the ammeter same.

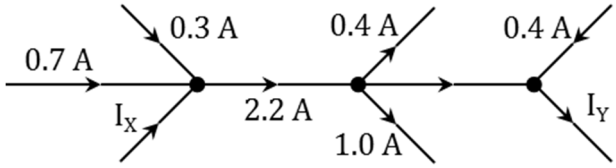
2. Find the equivalent resistance between the terminals A and B.



3. Find the current in the circuit shown below.

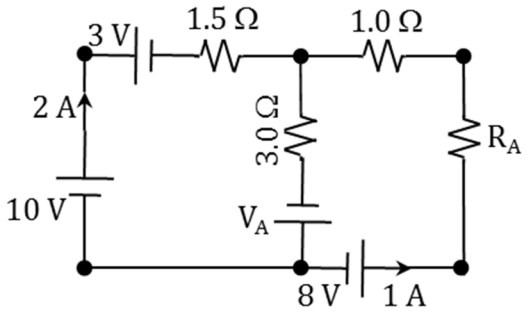


4. For the portion of the circuit shown below, the values of I_X and I_Y are respectively



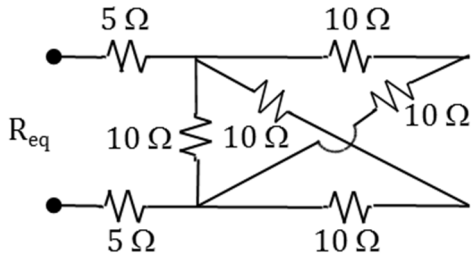
5. Three equal resistors connected in series dissipate 10 W of power. If the same resistors are connected in parallel across the same voltage source, determine the power dissipated.

6. For the following circuit, determine the Voltage V_A and Resistance R_A.



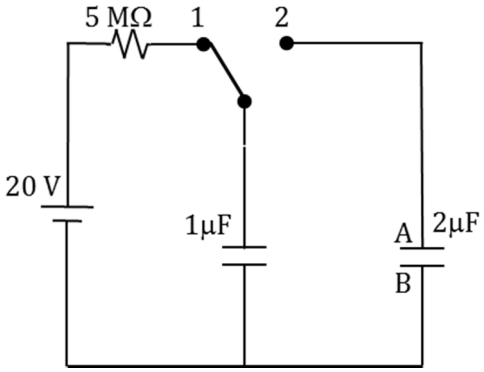
7. In a given circuit element the direction of the current is
    a. Same as the flow of electrons
    b. Opposite to flow of electrons
    c. From positive terminal to negative terminal
    d. Both a. and b.
    e. Both a. and d.
    f. Both b. and c.
    g. Both b. and d.
8. Identify the correct order of low to high resistivity.
    a. Silver, Aluminum, Iron, Carbon, Silicon
    b. Iron, Silver, Aluminum, Carbon, Silicon
    c. Iron, Aluminum, Silver, Silicon, Carbon
    d. Aluminum, Iron, Carbon, Silver, Silicon
    e. Silicon, Carbon, Aluminum, Silver, Iron

9. Find the equivalent resistance for the following circuit



10. After a long time in position 1, the 1μF capacitor is fully charged. What is the charge on this capacitor?

11. The switch is thrown to position 2 and stays in that position. Determine the final charge for both capacitors after the circuit has stabilized.



12. What is the polarity of plate A of the capacitor after the circuit has stabilized?

13. How much energy was dissipated in the circuit between initial (when the switch is thrown in position 2) and final (circuit has stabilized) states?

14. Define Permittivity. What are the SI units for Permittivity?

15. For the following Circuit find
    a. the value of resistance R_L, if the current through it is 0.5 A.
    b. the <u>direction</u> and <u>magnitude</u> of current through resistances 6 Ω, and 12Ω,
    c. the Thévenin equivalent voltage V_{Th},
    d. the Thévenin equivalent resistance R_{Th},
    e. the Norton equivalent current source I_N, and
    f. the Norton equivalent Resistance R_N.