Problem 5

This is a set of questions that must be answered as a group. You choose the distribution of questions, but a student cannot answer continuous questions. For example, a specific choice can be: {1,5,7,10,15} => In such a way that different points can be seen.

Initial bibliography (Sears chapter 25 | Tipler chapter 22)

1. What would happen if two conducting spheres were connected by a copper, gold, or plastic wire, and why is the material important?
2. What is electric current? What is the conventional meaning of electric current?

3. What can you understand as drag speed?

4. What can you understand as the density of charge carriers?

5. How fast does current move in a conductor?

6. You should look for information on what current density is.

7. What is electrical resistance?

8. What is color coding in electrical resistance?

9. What is the power of an electrical resistor and what does it mean physically?

10. Mathematically define Ohm's law and its mathematical proof.

11. How does an electric battery work?

12. What is electromotive force and internal resistance?

13. What is the energy and power of a circuit?

14. What types of battery arrangements exist? (Serial | Parallel)

15. What is the total capacity of a battery array?

16. What is a voltage splitter? And what is a current splitter?

17. What is a node and a mesh?

18. What is Kirchhoff's law for current and Kirchhoff's law for voltage?

19. What is the Joule effect?

20. Investigate the importance and effect of grounding. Describe the procedure.

After discussing the above questions in a group, each participant should propose a possible solution to the systems. After being analyzed and discussed the solutions among the members. The best solution to the problem must be presented together with the analysis of the 20 questions.
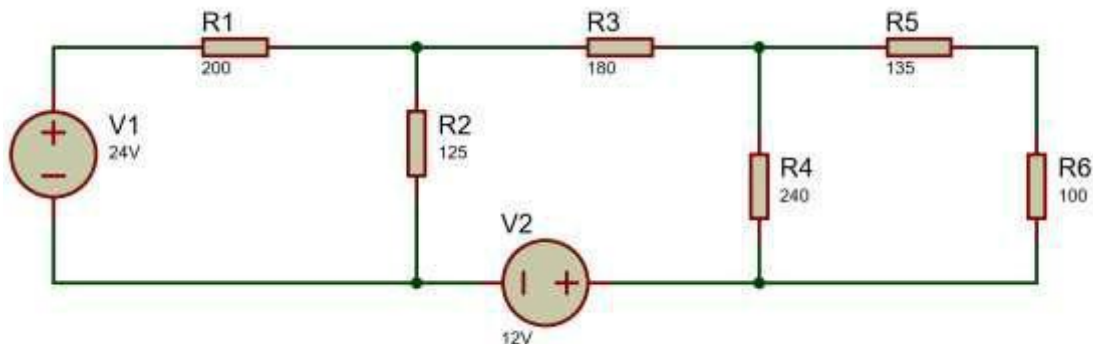
System 1

The job of designing a lighting system for a country house arrives at his startup. The homeowner wants the lighting system to be as efficient as possible in terms of energy consumption and cost, but also wants it to provide enough light in all areas of the house.

The house has a total of 10 rooms, including a living room, a kitchen, four bedrooms, two bathrooms, a study, and a game room. The house is powered by a 120V and 10 (DC) electrical power source. The homeowner wants each room to have at least two 10-watt LED lights, except the living room, which will need to have four 20-watt LED lights. Also, the kitchen should have one 15-watt light and the game room should have two 15-watt lights.

How would you design the electrical circuit to meet the homeowner's requirements, taking into account the capacity of the available power source and energy efficiency? What electrical components would you need and how would you connect them to achieve an optimal and efficient design in terms of cost and energy consumption?

System 2

Develop the following electrical circuit. That is, calculate the current in each branch of the circuit and the power consumed by each resistor.

System figure 2.