

DESCRIPTION: Students will compete in activities involving knowledge of direct current (DC) Electrical Circuits. The event may include hand-on experimentation and/or problem solving. Students may use non-programmable calculators.

A TEAM OF UP TO: 2

APPROXIMATE TIME: 50 minutes

THE COMPETITION:

The competition will consist of tasks and questions related to DC electrical circuits. The event supervisor may provide some mathematical relationships but the students are expected to know:

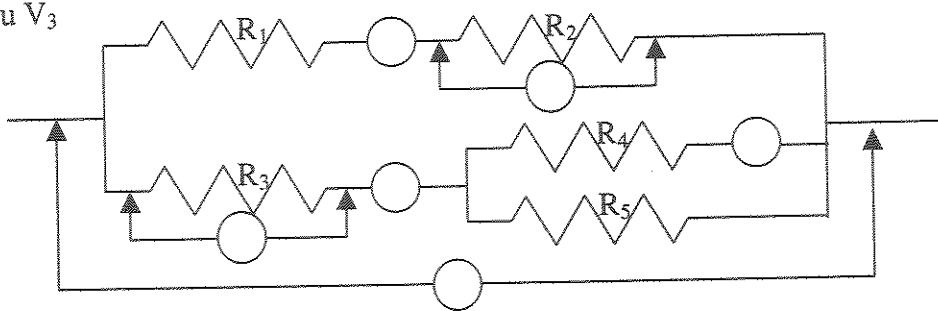
- 1) The basic mathematical statements, definitions, concepts and principles involved.
- 2) Simple DC circuits theory including voltage, current, power, conversion of electric power to heat, RC time constants (charging and/or discharging of a capacitor through a resistor by a constant voltage source), conventional current and/or electron current, energy stored in a capacitor, Ohm's Law, electrical SI units (Coulomb, ampere, Volt, Ohm, Farad, Joule, Watt, second;
- 3) The characteristics of DC circuit components such as Electromotive Force Devices (DC power supplies, batteries and DC generators), resistance, internal resistance of EMFs, capacitors, diodes, solar cells, and DC motors;
- 4) The theory, use, and limitations of DC measurement equipment such as Galvanometers, Voltmeters (including limiting resistor calculations), Ammeters (including shunt resistor calculations), and Multimeters.

Supervisors are encouraged to use computer and/or calculator sensors/probes wherever possible or provide students with data sets collected by such sensor/probes following demonstration of the data collection. If used, data will be presented in a tabular and/or graphic format and students will be expected to interpret the data.

Examples of Circuit Lab Stations:

A circuit consisting of resistors in parallel and/or series and one or more batteries in parallel and/or series will be assembled. Students will be asked to determine electric potential difference between specified locations within the circuit, currents (including direction of electron or conventional flow), resistance, and power dissipation in different parts of the circuit. The circuits may also include diodes, solar cells and DC power supplies. The internal resistance of the batteries may be one of the values to be determined. Students are expected to know basic electrical definitions, equations and how to use electrical meters and multimeters.

- Given A_1 thru A_3 & V_1 thru V_3
Find R_1 thru R_5
- Given R_1 thru R_5 , Find A_1
thru A_3 & V_1 thru V_3



SCORING: Points will be awarded for correct answers and/or proper technique. Ties will be broken using a designated task or question(s). The event supervisor will identify the tie breaker question(s) or task(s) on the answer form provided to the students at the beginning of the competition period. If more than one competition period is used, the tie breaker(s) will be the same for all periods.