

## **Answer on Question 47779, Physics, Electric Circuits**

### **Question:**

Explain how safety devices protect the appliances in the circuit.

### **Solution:**

There are two types of safety devices that protect the appliances in the circuit: circuit protection and operator protection. Circuit protection would be devices to interrupt excessive current for example. Some examples of circuit protection devices and how it works:

- Fuse - is a type of low resistance resistor that acts as a safety device to provide over current protection, of either the load or source circuit. It is essential component is a metal wire or strip that melts when too much current flows through it, interrupting the circuit that it connects.
- Positive temperature coefficient thermistor - limits current by increasing its resistance when heated. Increased current flow generates heat which raises its resistance thereby limiting current.
- Low voltage trip - stops system if low voltage condition is encountered.
- Low voltage release - same as low voltage trip but will auto restart when correct voltage is applied.
- Loss of phase relay - opens when one or more phases of 3 phase power are lost.

Operator protection would be devices to prevent personnel from being injured or shocked by hazardous voltages or unsafe conditions. Examples of operator protection:

- Ground fault circuit interrupter (GFCI) is a device that shuts off an electric circuit when it detects that current is flowing along an unintended path, possibly through water or through a person. It is used to reduce the risk of electric shock. It works by measuring the current leaving the hot side of the power source and comparing it to the current returning to the neutral side. If they are not equal, this means that some of the current is flowing along an unintended path, and the GFCI shuts the power off. When the problem is corrected, the GFCI can manually be reset by pushing the reset button.
- Isolation Transformer - limits amount of current that can be passed to the circuit, prevents full line current from reaching the circuit or operator.
- Electro-motive braking - uses back electro motive force in a motor to hasten the stopping of a motor.