CIRCUIT BREAKERS, FUSES AND SWITCHES

A circuit breaker is an electromagnetic device that opens the circuit automatically when the current exceeds a predetermined value. It can be reset operating a lever or by other means. A fuse is a protective device containing a short length of special wire that melts when the current through it exceeds the rated value for a definite period of time. A fuse is inserted in series with the circuit being protected, so it opens the circuit automatically during a serious overload. A switch is a manually, or mechanically, electrically or electronically actuated device for making, breaking, or changing the connections in an electric circuits. Their function, to put it simple, is to protect the circuit in which they are built from possible damages. They are designed to interrupt excess current that can overload the electrical wires, and they cut off the circuit whenever the current jumps above a safe level.

A circuit breaker, unlike a fuse, which operates once and then has to be replaced, can be reset (either manually or automatically) to resume normal operation. The choice of a proper circuit breaker depends on the particular application, i.e. it may be a small device used for protecting individual household appliance, or a large switchgear designed to protect high voltage circuits feeding an entire city. A circuit breaker is required to

* withstand the maximum voltage stress,
* carry rated current continuously without damage,
* have sufficient interrupting capacity,
* be suitable for operation in the intended environment
* provide the protective function or protective and control functions if needed.

There are many types of switches available for electric circuits. All switches perform the same basic function of opening or closing circuits. The type used in a given application is often a matter of style and/or convenience of operation. When the switching requirements are complex, the choice narrows to the rotary switch. On the other hand, simple switches, such as toggles, slides, rockers, levers etc, usually control only one or two circuit paths. Some switches are constructed so that they always return to the same position when released by the operator. There are also safety switches which look similar to circuit breakers, but they provide extra protection from electric shock. Safety switches monitor the flow of electricity and if any irregularity is detected, the electricity supply is immediately cut off.

Fuses have the advantage of often being less expensive and simpler than a circuit breaker for similar rating. However, a blown fuse must be replaced with a new device while a circuit breaker is simply reset. While circuit breakers must be maintained on an annual basis to ensure their mechanical operation, this is not the case with fuses; no mechanical operation is required for the fuse to operate under fault conditions. Old electrical consumer units were fitted with so called Swiss electric fuses (6 to 10 A) and are still in use in some older European buildings. Modern consumer units contain magnetic circuit breakers instead of fuses. Fuses are often characterized as “fast-blow” or “slow-blow” according to the time they take to respond to an overcurrent condition. A fuse also has a rated interrupting capacity, also called breaking capacity, which is the maximum current the fuse can safely interrupt.

DISCUSSION QUESTIONS

1. What is the function of circuit breakers, fuses, and switches?

2. What is the difference between a circuit breaker and a fuse when they have to resume normal operation?

3. What are the requirements of a circuit breaker?

4. What are the types of simple switches?

5. How many circuit paths do simple switches usually control?

6. What is the difference between safety switches and ordinary simple switches?

7. What do safety switches monitor?

8. What happens if any irregularity is detected within the circuit?

9. What are the advantages of fuses over circuit breaker?

10. What is rated interrupting capacity?

MAKE SENTENCES CONNECTING As and Bs:

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| --- | --- |
| A | B |
| 1. Electricity is defined by three major attributes,2. To understand circuit breakers,3. Voltage is the “pressure”4. When the fuse carries an excess of current over its rated capacity,5. Current is the rate at which6. The circuit breaker is one of7. Voltage, current and resistance are all interrelated,8. Switches are devices which make, break, or change9. Circuit breakers can10. A fuse consists of a strip of wire or metal | 1. it helps to know how household electricity works.2. that makes electric charge move.3. the charge moves through the conductor4. the most important safety mechanisms in our home.5. you can’t change one without changing another.6. the connections in an electric circuit7. be reset.8. inserted in series with a circuit.9. voltage, current and resistance.10. it burns out. |