

Ans. 01

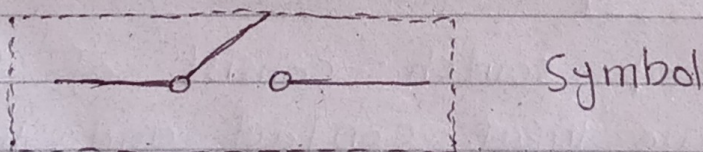
Part (A) Types of switches :

There are different types of switches and different types of switch used in electrical circuits. Some of them are given below.

* Mechanical Switches :

Mechanical switches can be classified into different types based on several factors such as method of actuation (Manual limits & Process switches) number of contacts (single contacts and multi contact switches)

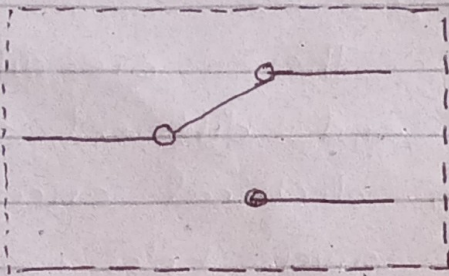
* Single Pole Single Throw Switch



\Rightarrow This is the basic ON and OFF switch consisting of one input contact and one output contact

\Rightarrow It switches a single circuit and it can either make ON or break OFF the load.

* Single pole double throw switch :

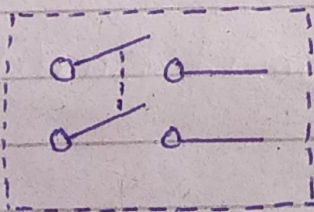


Symbol of SPDT

\Rightarrow This type of switch contains three terminals. The one terminal is input and the remaining two are output.

\Rightarrow This means it consists of two ON positions and one OFF position.

* Double pole single throw switch :

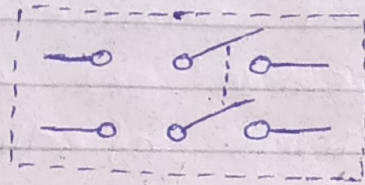


Symbol of DPST

\Rightarrow This type of switch consists of four terminals, two input contacts and two output contacts.

\Rightarrow It behaves like two separate SPST configurations, operating at the same time.

★ Double pole double throw switch:



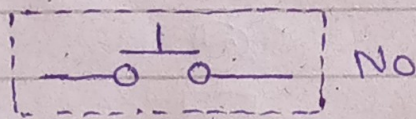
Symbol of DPDT

\Rightarrow This is a dual ON/OFF switch consisting of two ON positions

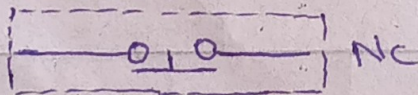
\Rightarrow It has six terminals, two are input contacts and remaining four are the output contacts.

\Rightarrow It behaves like a two separate SPDT configuration, operating at the same time.

★ Push Button Switch:



Symbol:



\Rightarrow It is a momentary contact switch that makes or breaks connection as long as pressure is applied.

\Rightarrow Generally, this pressure is supplied by a button pressed by someone's finger.

Ans

1

Part (b): High voltage switchgear are categorized

① Gas insulated indoor type.

② Air insulated outdoor type.

Again outdoor type air insulated circuit breaker are classified as.

① Dead tank type circuit breaker.

\Rightarrow The switching device is located with suitable insulator supports inside a metallic vessel of ground potential. Filled with insulating medium.

② Live Tank type circuit breaker:

\Rightarrow The switching device is located on insulating bushings at the system potential. The live tank circuit breaker are cheaper and required less space.

⇒ There are mainly four types of circuit breakers

→ Air blast circuit breaker.

→ SF₆ circuit breaker.

→ Oil circuit breaker.

→ Vacuum circuit breaker.

Ans 02

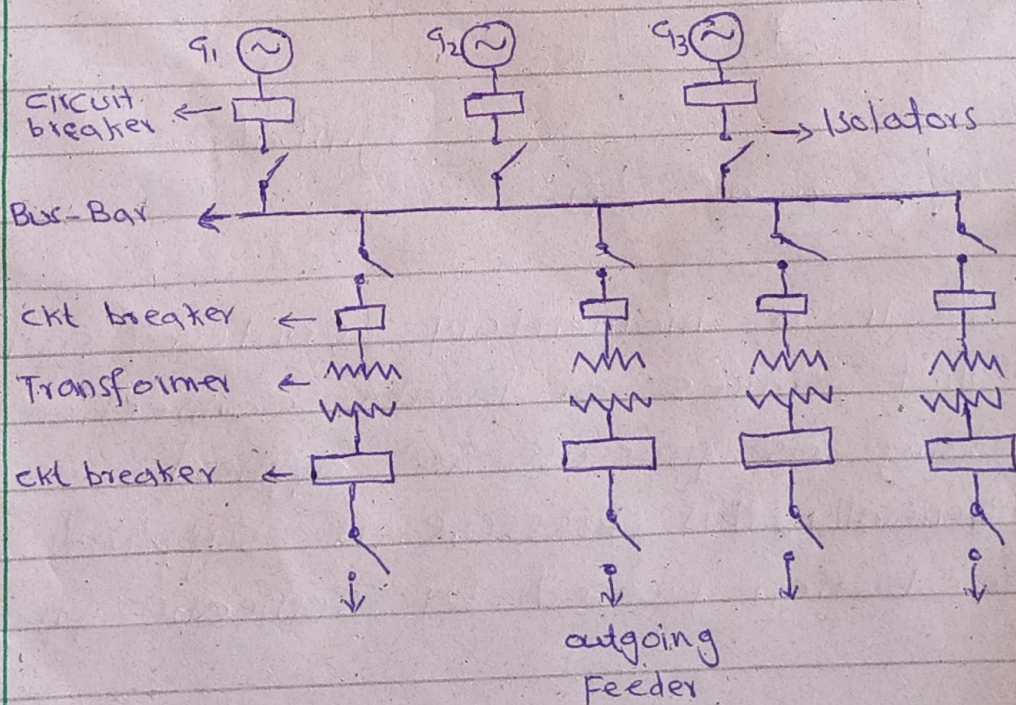
Part (A) Single Bus-Bar arrangement :-

This is the simplest arrangement consisting of a single set of bus bars for the full length of the switchboard and to this set of bus bars are connected all the generators, transformer and feeder, as illustrated by single line diagram.

Each generator and feeders is connected controlled by a circuit breaker.

The isolator permit isolation of generators, feeders and circuit breaker from the bus bar for the maintenance.

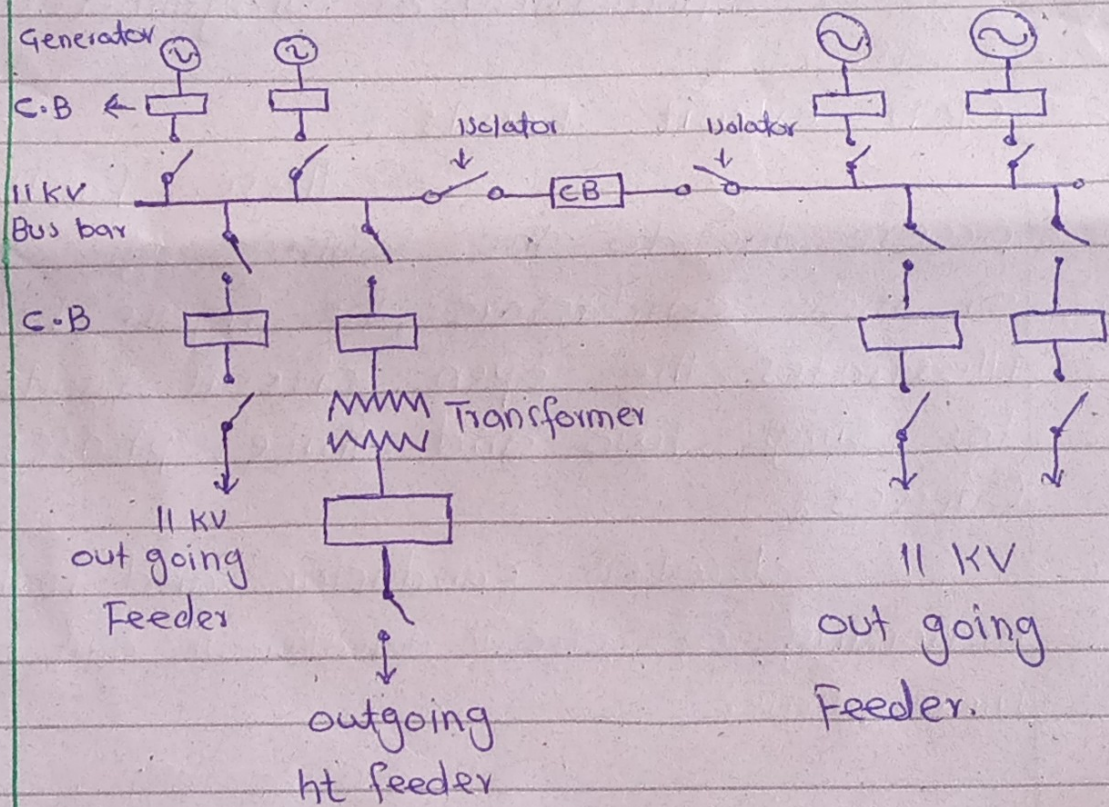
The chief advantages of such a bus-bar arrangement are low initial cost less maintenance and simple operation.



Part ②

Single Bus-Bar Arrangement with Bus-Sectionalization.

The bus bar may be sectionalized by a circuit breaker and isolating switches so that a fault on one part does not cause a complete shutdown. In large generating stations, where several units are installed, it is a common practice to sectionalize the bus illustrated in figure.



Part (b) Faults in power system :

In electric power system a fault or fault current is any abnormal electric current. For example, a short circuit is a fault in which current bypasses the normal load.

* Electrical faults in three phase power system, mainly classified into two types, namely open and short circuit faults. Further these faults can be symmetrical or unsymmetrical faults.

⇒ Open circuit Faults :

These faults occur due to the failure of one or more conductors. The figure below illustrates the open circuit faults for single, two and three phases
Causes :

Broken conductor and malfunctioning of circuit breaker in one or more phase.

⇒ Short circuit faults :

A short circuit fault can be defined as an abnormal connection of very low impedance between two points of different potential.

Causes :

These are may be due to internal or external effects.

⇒ Internal effects include breakdown of transmission line or equipment, aging of insulation, deterioration of insulation in generator transformer.

Ans :

③

Part (A) Switch and circuit breaker:

Switch:

- \Rightarrow switch allow the user to cut off Power supply to a certain area or equipment
- \Rightarrow switch operates at low voltage
- \Rightarrow No provision for arc rupturing.
- \Rightarrow operates manually.

Circuit Breaker:

- \Rightarrow circuit breaker are more preventive in nature.
- \Rightarrow operates at high voltage
- \Rightarrow Have arc rupturing arrangement.
- \Rightarrow operates manually as well as automatically by the command of relay.

Part (b) : Fuse and circuit breaker :

Fuse :

- \Rightarrow Fuse works on the electrical and thermal properties of the conducting material.
- \Rightarrow Fuse can be used only once.
- \Rightarrow It does not give any indication
- \Rightarrow No auxiliary contact is required.
- \Rightarrow Fuse cannot be used as an ON/OFF

Circuit Breaker :

- \Rightarrow circuit breaker work on the electromagnetism and switching principle.
- \Rightarrow circuit breaker can be used number of times.
- \Rightarrow It give an indication of the status.
- \Rightarrow The circuit breaker is used as an ON/OFF