SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NAAC – UGC with 'A' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EE605-PROTECTION AND SWITCHGEAR

III YEAR /VI SEMESTER EEE

ZONES OF PROTECTION

ZONES OF PROTECTION

- In a protective relaying scheme, it is a usual practice to divide the entire system into several protection scheme.
- When a fault occurs in a given zone, then only the circuit breakers within that zone will be opened.
- This will isolate only the fault part, leaving the healthy circuit intact.
- A protective zone is the separate zone which is established around each system element.

- The significant of such a protective zone is that any fault occurring within a given zone will cause the tripping of relays which causes opening of all the circuit breakers located with in that zone.

(i)Generators

(ii)Low tension switchgear (LT)

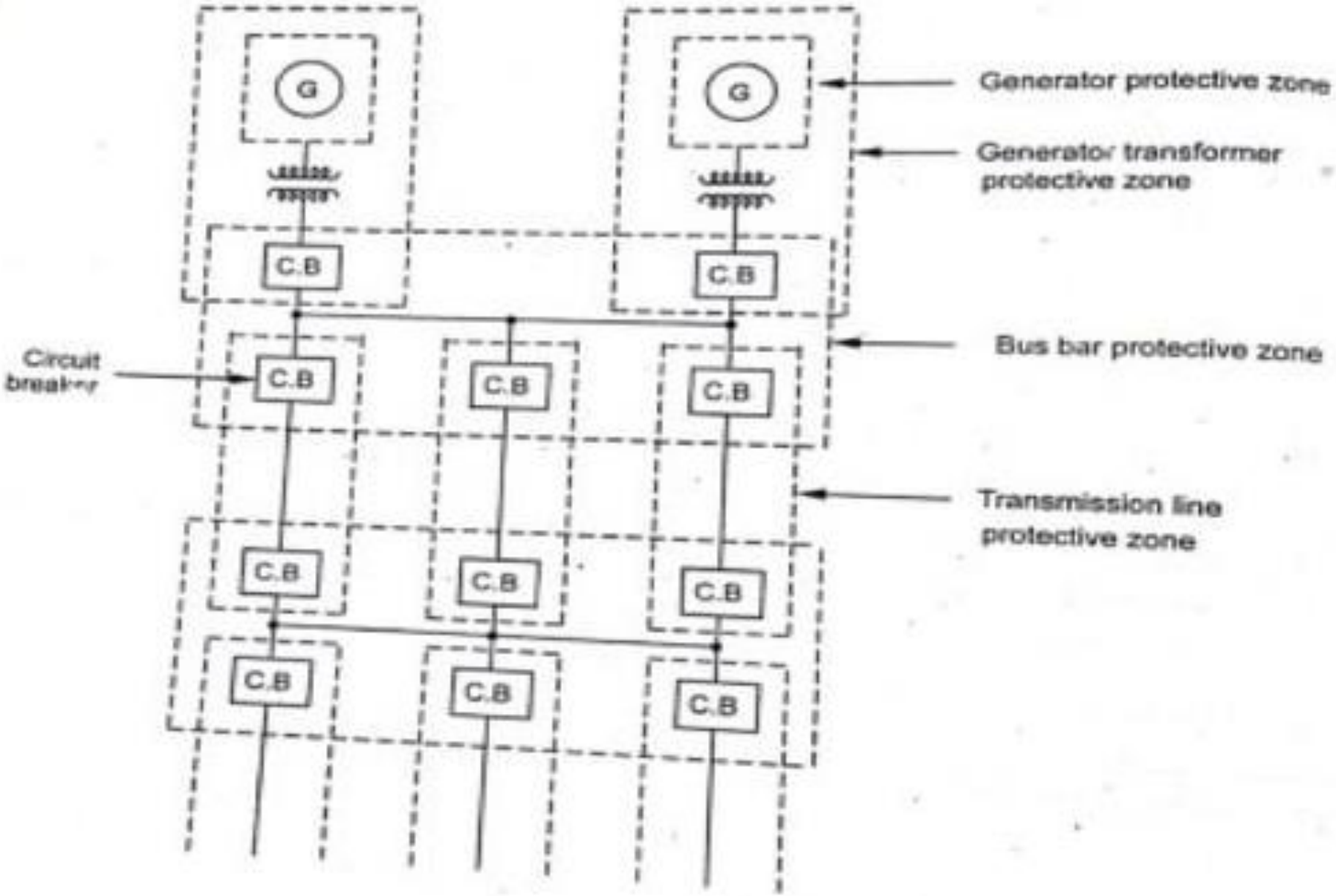
(iii) Transformers

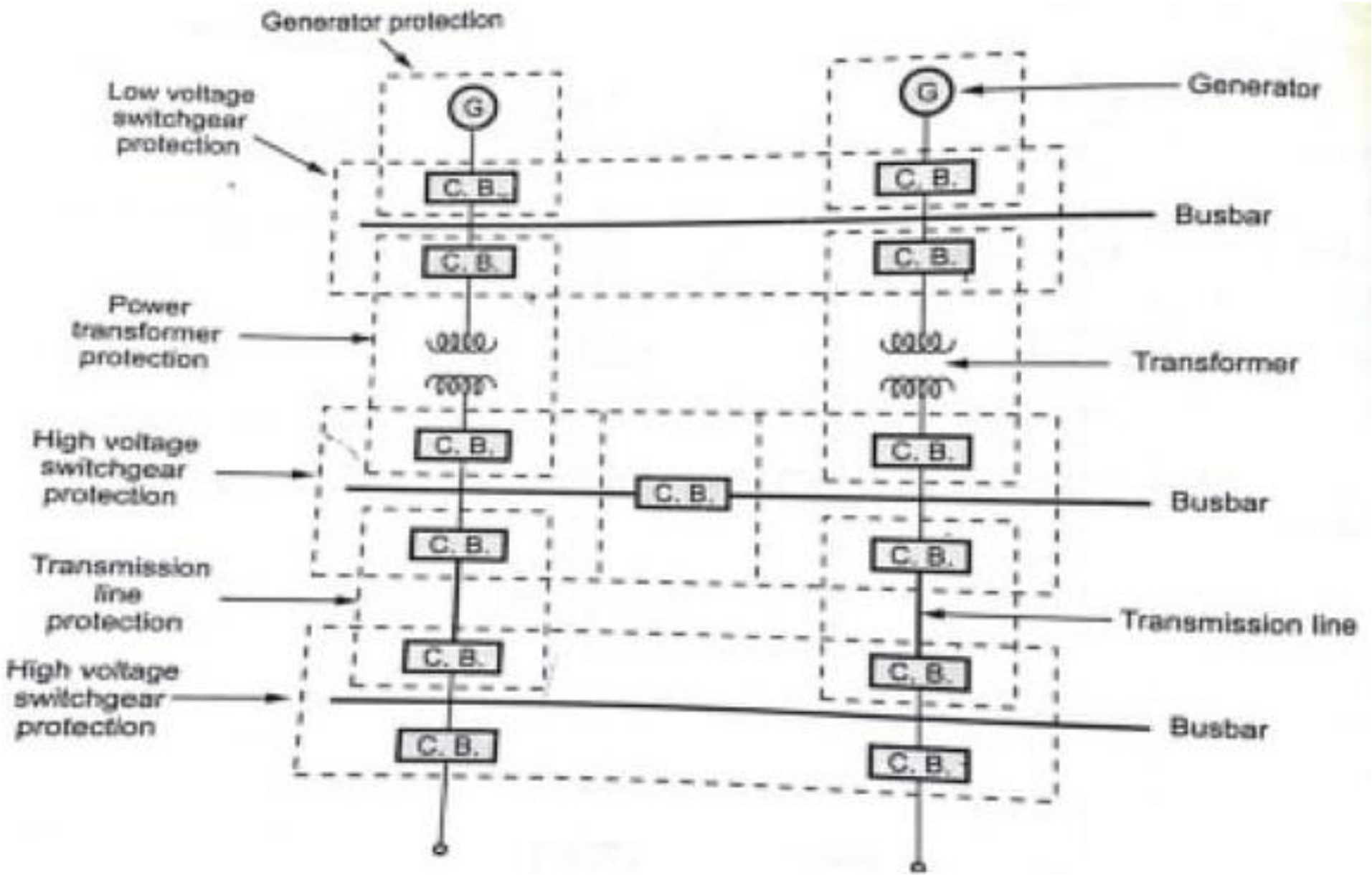
(iv) High-tension switchgear (HT)

(v)Transmission lines

- The boundaries of protective zone are decided by the locations of CT.
- The overlapping is done to ensure complete safety of each and every element of the system.

- The zone which is not protected is called dead spot.
- If there are no overlaps, then dead spot may exist, means the circuit breakers lying within the zone may not open even if the fault occurs.
- This causes damage to the healthy system.
- The probability of the failures in the overlapped region is very low and therefore the opening of too many C.B. will also be infrequent.
- Each zone has certain protective scheme and each protective scheme


G
G
C.B
C.B
C.B
C.B
C.B
C.B
C.B
C.B
C.B
Circuit breaker
Generator protective zone
Generator transformer protective zone
Bus bar protective zone
Transmission line protective zone


Generator protection
Low voltage switchgear protection
G
Generator
C. B.
Busbar
Power transformer protection
Transformer
High voltage switchgear protection
Busbar
Transmission line protection
Transmission line
High voltage switchgear protection
Busbar

Primary and Back-up protection

- Primary protection is the main protection provided for protecting the power system elements from all types of faults.
- If the primary protection fails, the back-up protection comes into action and removes the faulty part from the healthy system.
- The backup protection is provided as the main protection can fail due to many reason like,

(a)Failure in C.B

(b)Failure in protective relay

(c)Failure in d.c tripping voltage

(d)Loss of voltage or current supply to the relay

- Thus if there is no backup protection and the main protection fails then there is possibility of severe damage to the system.
- From the cost and economy point of view, the backup protection is employed only for the protection against S.C and not for any other abnormal conditions.

Concept of back-up relay

- The main requirement of backup relaying is that it must operate with minimum time delay so that the primary relaying is given a chance to operate.
- When fault occurs both type of relays starts relaying operation but primary is expected to trip first and backup will reset without having time to complete its relaying operation.

Methods of back up protection

(a)Relay back up protection

(b)Breaker back up protection

(c)Remote back up protection

(d)Centrally co-ordinated back-up protection

Essential qualities of protective relaying

A well designed and effective relaying should have the following essential qualities

- Speed

The relay system should disconnect the faulty section as quickly as possible for the following reasons.

(i)Improves the stability

(ii)Decreases the amount of damage caused

(iii) decreases the possibility of development of one type of fault into other more severe type.

- **Selectivity**

It is the ability of the protective system to determine the point at which the fault occurs and disconnect the faulty part without disturbing the rest of the system.

- **Sensitivity**

It is the ability of the relay system to operate with low value of actuating quantity. The relay should be sensitive to operate when the fault current exceeds the pickup value and should not operate when the fault current is less than pickup value.

Sensitivity factor(Ks=Is/Io)

- **Reliability**

It is the ability of the relay system to operate under the pre-determined conditions.

- **Simplicity**

The relaying system should be simple so that it can be easily maintained. It is closely related with the reliability.

- **Economy**

The most important factor in the choice of a particular protection scheme is the economic aspect.

As a rule, the protection cost should not be more than 5% of the total cost.