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

METHODS OF NEUTRAL GROUNDING

POWER SYSTEM EARTHING

- In power system grounding or earthing means connecting frame or electrical equipment (non current carrying part)or some electrical part of the system(e.g. neutral point in a star connected system, one conductor of the secondary of the transformer) to earth.
- Grounding provides protection to the power system
- Earthing of electrical equipment ensures the safety of the persons handling the equipment.

Grounding or Earthing

- The process of connecting the metallic frame (i.e non-current carrying part) of electrical equipment or some electrical part of the system (e.g. neutral point in a star connected system, one conductor of the secondary of a transformer) to earth is called grounding or earthing.

Neutral Grounding

- Connecting neutral point to earth (i.e. soil) either directly or some circuit element

  (e.g. **resistance, reactance , Peterson coil** etc.) is called **neutral grounding.**

- Neutral grounding provides protection to equipment. (during earth fault, the current path is completed neutral)

Advantages of Neutral Grounding

(i) Voltages of the healthy phases do not exceed line to ground voltages i.e. they remain nearly constant.

(ii) The high voltages due to arcing grounds are eliminated.

(iii) Life of insulation is long.

(iv) The over voltages is reduced.

(v) It provides greater safety to personnel and equipment.

(vi) It provides improved service reliability.

(vii)Operating and maintenance expenditures are reduced.

Methods of Neutral Grounding

(i) Solid or effective grounding

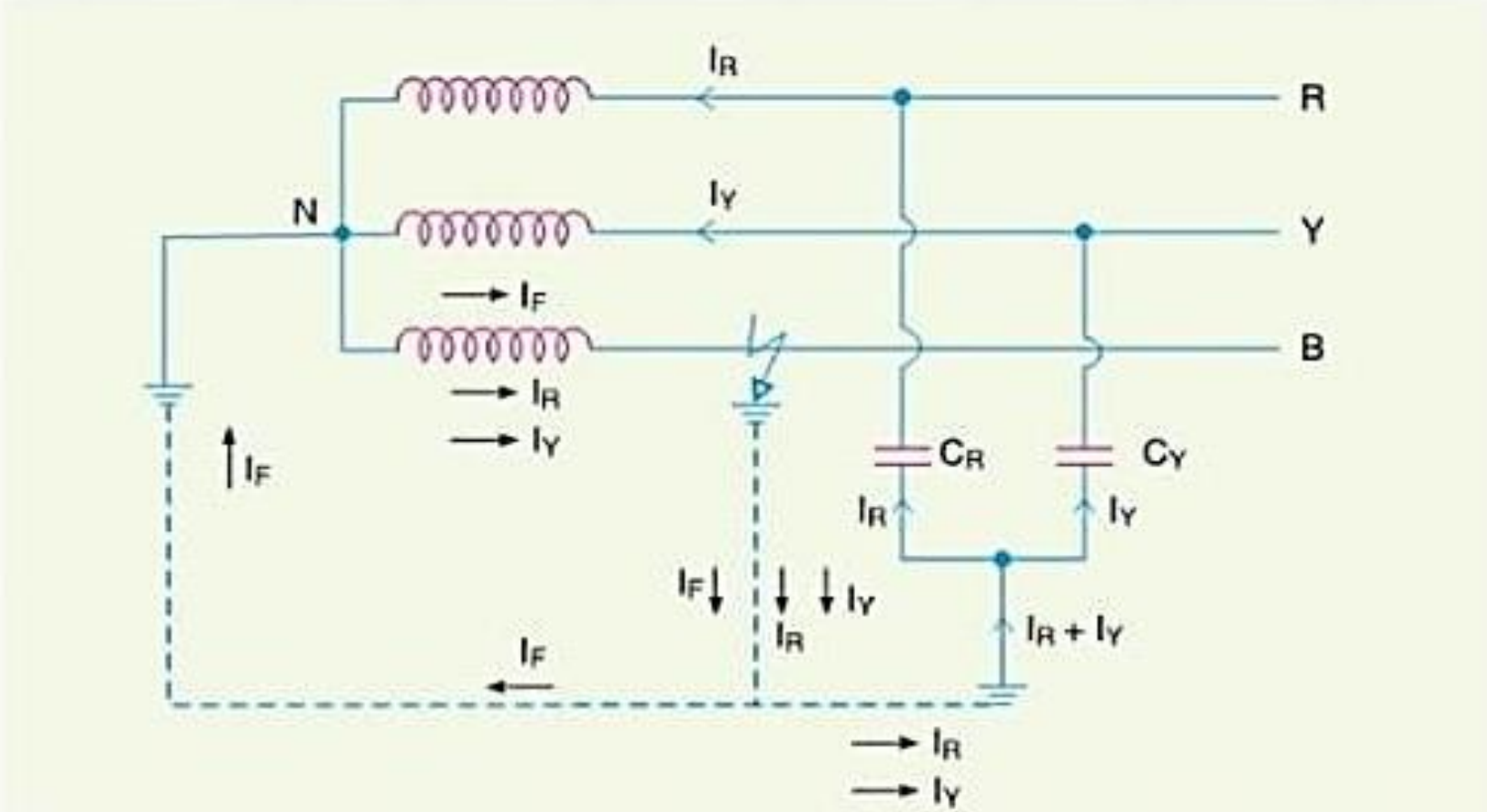
(ii) Resistance grounding

(iii) Reactance grounding

(iv) Peterson-coil grounding

(v) Voltage transformer earthing

(i) Solid or effective grounding

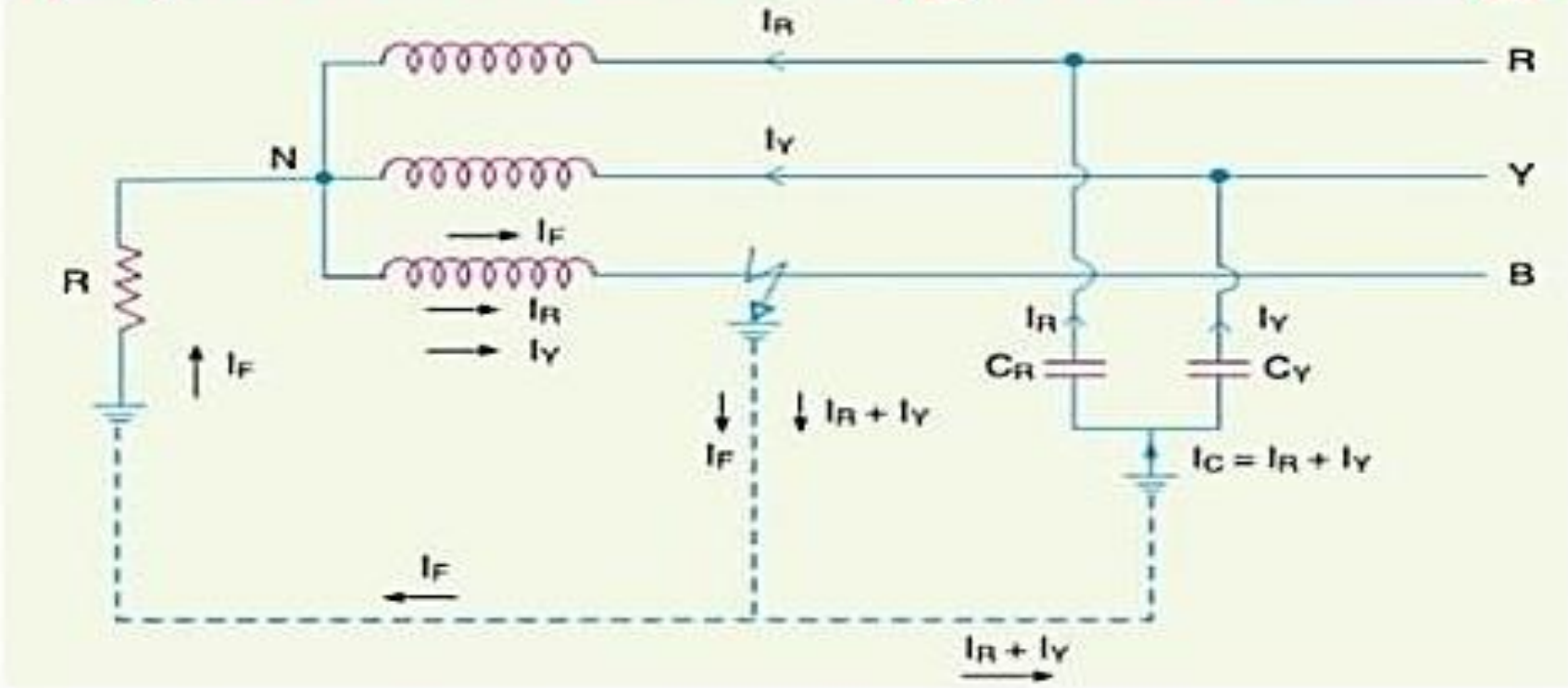


- When the neutral point of a 3-phase system is directly connected to earth (i.e. soil) is called **solid grounding or effective grounding**.
- When an earth fault occurs between earth and any one phase , the voltage to earth of the faulty phase becomes zero, but the healthy phases remains at normal phase values.
- Fault current(I_F) completely nullified by capacitive current(I_C)

Resistance grounding

- In order to limit the magnitude of earth fault current, it is a common practice to connect the neutral point of a 3-phase system to earth through a resistor. This is called resistance grounding.

(ii) Resistance grounding



When the neutral point of a 3-phase system (e.g. 3-phase generator, 3-phase transformer etc.) is connected to earth (i.e. soil) through a resistor, it is called resistance grounding.

Advantages:

- By adjusting the value of R, the arcing grounds can be minimized.
- It improves the stability
- Less interference
- Minimize hazards

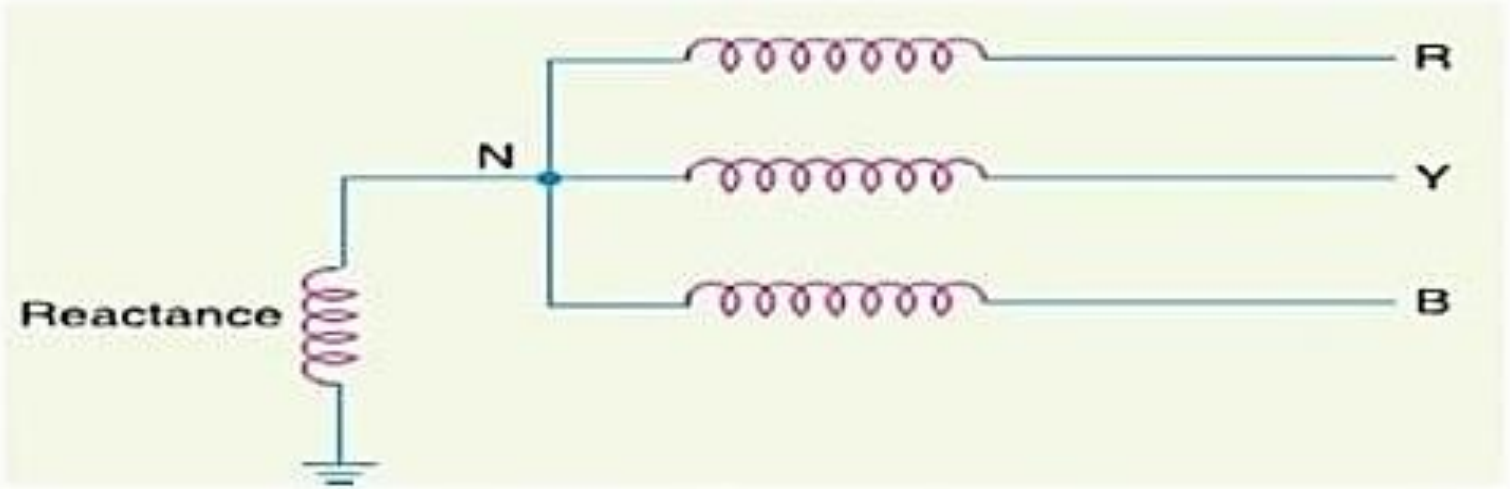
Disadvantages:

- The system neutral is displaced during earth faults, the equipment has to be insulated for higher voltages.
- This system is costlier than the solidly grounded system.
- A large amount of energy is produced in the earthing resistance during earth faults.

Applications:

- It is used on a system operating at voltages between 2.2kV and 33kV with power source capacity more than 5000kVA.

(iii) Reactance grounding



- In this system, a reactance is inserted between the neutral and ground
- The purpose of reactance is to limit the earth fault current.

Disadvantages :

(i) In this system, the fault current required to operate the protective device is higher than that of resistance grounding for the same fault conditions.

(ii) High transient voltages appear under fault conditions.