SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EE605 PROTECTION AND SWITCHGEAR

III YEAR /VI SEMESTER

Unit 1- PROTECTION SCHEMES

Topic: Fault Current Calculation

Symmetrical Components Method

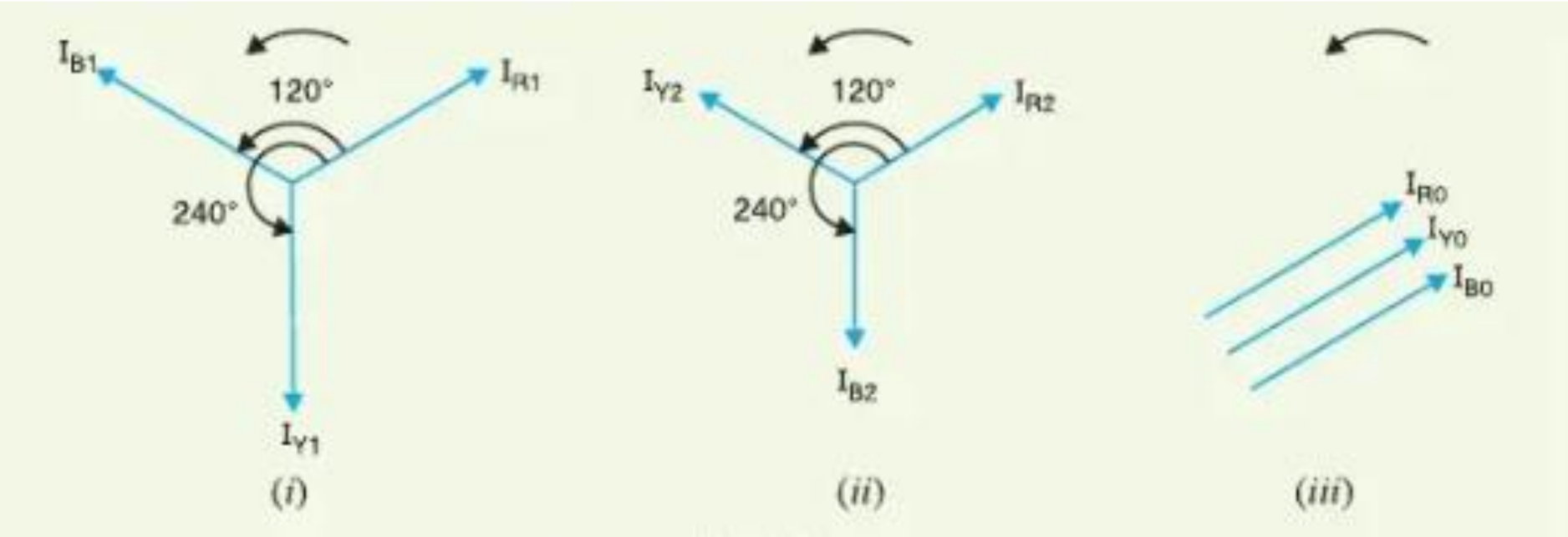
- In 1918, Dr. C.L. Fortescue, an American scientist, showed that any unbalanced system of 3-phasecurrents (or voltages) may be regarded as being composed of three separate sets of balanced vectors.

(*i*) a balanced system of 3-phase currents having positive (or normal) phase sequence. These are called *positive phase sequence components.*

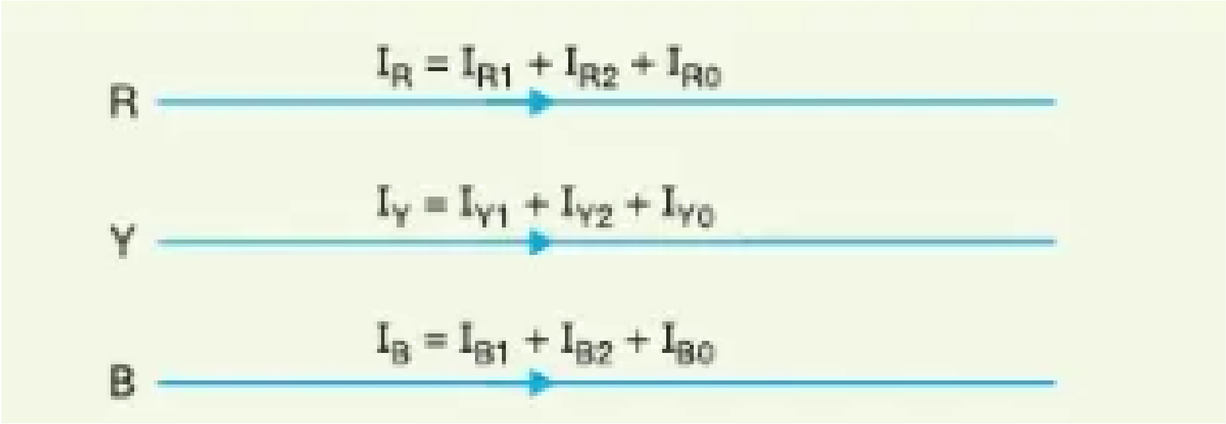
(*ii*) a balanced system of 3-phase currents having the opposite or negative phase sequence. These are called *negative phase sequence components.*

(*iii*) a system of three currents equal in magnitude and having zero phase displacement. These are called *zero phase sequence components*

- The positive, negative and zero phase sequence components are called the *symmetrical components* of the original unbalanced system.
- The term ‘symmetrical’ is appropriate because the unbalanced 3-phase system has been resolved into three sets of balanced (or symmetrical) components.
- The subscripts 1, 2 and 0 are generally used to indicate positive, negative and zero phase sequence components respectively.



- The current in any phase is equal to the vector sum of positive, negative and zero phase sequence currents in that phase.



Operator ‘a’

- As the symmetrical component theory involves the concept of 120º displacement in the positive sequence set and negative sequence set, therefore, it is desirable to evolve some operator which should cause 120º rotation.
- For this purpose, operator ‘*a*’ (symbols *h* or λ are sometimes used instead of ‘*a*’) is used.
- It is defined as under : *The* **operator ‘*a*’** *is one, which when multiplied to a vector rotates the vector through 120º in the anticlockwise direction*

Assessment

1. An over current relay having a current setting of 150% is connected through a 400/5 CT. The pickup value of current is

   a) 2.5 A

   b) 5 A

   c) 7.5 A.

   d) 10 A

References

1. SuniS Rao, “Switchgear, Protection and Power System (Theory, Practice & Solved Problems)”, Khanna Publishers, New Delhi, 2019.

2. Paithankar Y G, Bhide S R, “Fundamentals of Power System Protection”, Prentice Hall of India Pvt Ltd., New Delhi, 2nd Edition, 2014.

3. Badriram, Vishwakarma B.H, “Power System Protection and Switchgear”, New Age International Pvt Ltd Publishers, 2nd Edition 2017.

Thank You