EXP. No. (4)
Three- Phase Transformer Connections

Object:
To study the connection of polarity for 3-phase operation of transformer.

Theory:
For 3-phase operation, we can use a single 3-phase transformer or a bank of three 1-phase transformers. The single unit of 3-phase transformer may cost about 15% less than a bank and will occupy much less space. There is little difference in reliability, but it is cheaper to carry spare for 1-phase than 3-phase transformers, if only one installation is concerned. The usual 3-phase connections are Y-Y, Δ-Δ, Y-Δ, Δ-Y.

Procedure:

Part 1: Checking for polarities of 3-phase transformer coils when the transformer does not connect to supply.

1- Make the connection as shown in fig. (1).
2- Connect the terminals A2 & B2.
3- Apply voltage on the two terminals A1 & B1, and read the voltage on coils C (i.e. C1 & C20, if its read zero or nearly zero the connection (i.e. two terminals A2 & B2) are symmetrical, otherwise the connection is unsymmetrical.
4- Repeat 2 and 3 for terminals A2 &B1, terminals A2 & C2, and terminals A2 & C1.

Part 2:
Checking for Y and Δ connections of secondary side of 3-phase transformer when primary side connected to 3-phase supply.

1- Make the connection as shown in fig. (2).
2- Connect the three terminals a4 b4 c4.
3- Apply voltage on primary side Y connected and read the voltmeter across the two terminals a1 b1, the two terminals a1 c1, and the two terminals b1 c1, if three voltages are equals and equals to $\sqrt{3}$ Vph, the three points a4 b4 c4 are

symmetrical and the secondary Y connection is true, otherwise the three points are unsymmetrical and Y connection is fail.

4- Repeat 2 and 4 for connections a4 b4 c1, a4 b1 c4, and a4 b1 c1.

5- Connect the coil terminal a4 to the coil terminal b1 and b4 to c1.

6- Apply voltage on primary side Y connections and read the voltmeter across the two terminals a1 c4, a1b4 and a4c4 , if the voltage across a1c4 is zero, and the voltage across a1b4 and a4c4 are equals and equal to phase voltage, the Δ connection on secondary side is true, otherwise the Δ connection on secondary side is fail.

7- Repeat 5 and 6 for connections (a4b1 and b4c4), (a4b4 and b1c1) and (a4b4 and b1c4).

Discussion:

1- Draw the phasor diagram of all cases in part 2.

2- Compare the advantage and disadvantage of a 3-phase transformer with a bank of three single phase transformer.

3- What is connection? Where the connection is used?

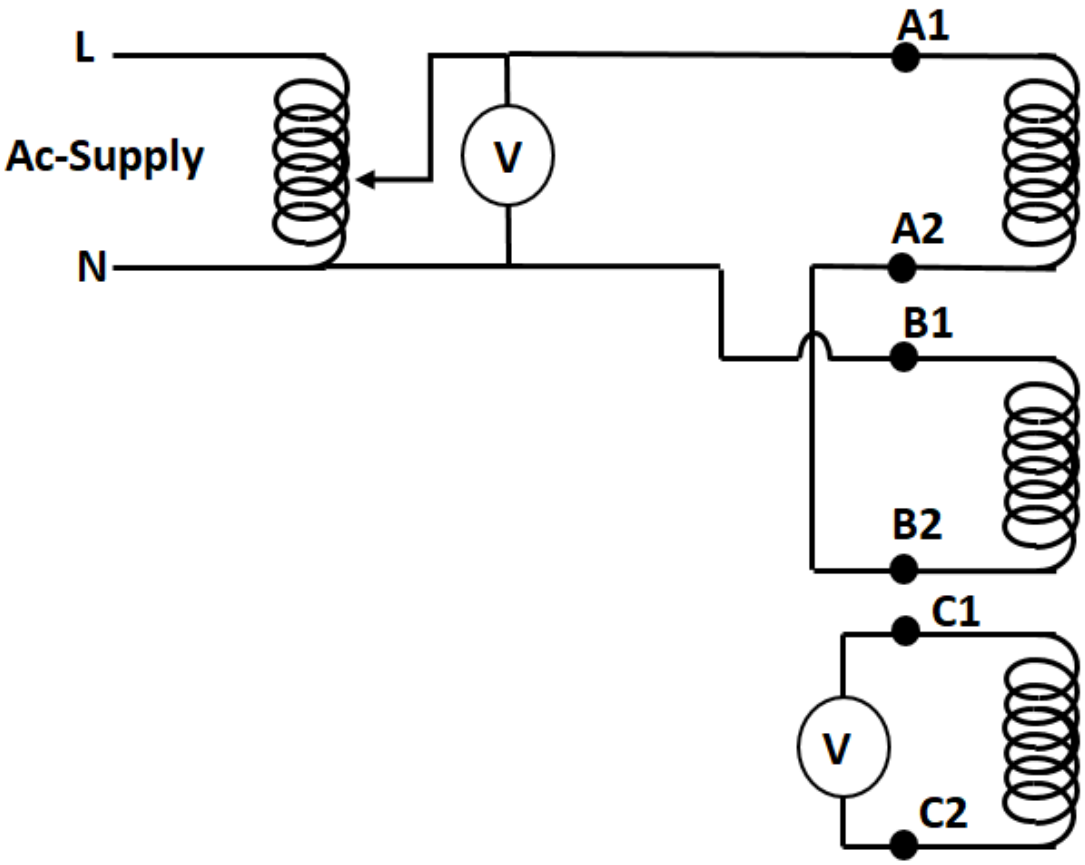

Fig.(1)

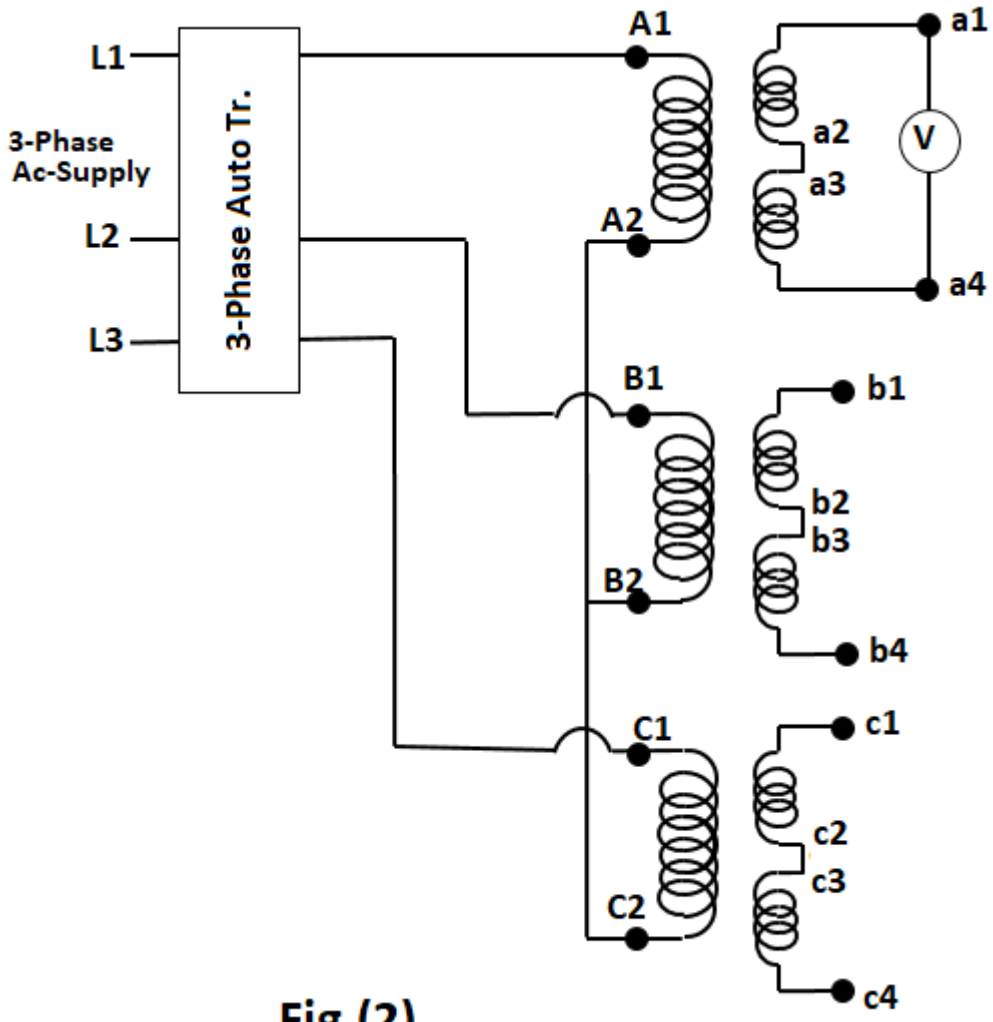
L1
3-Phase
Ac-Supply
L2
L3
3-Phase Auto Tr.
A1
A2
a1
a2
a3
a4
V
B1
B2
b1
b2
b3
b4
C1
C2
c1
c2
c3
c4

Fig.(2)