TITLE: - Study of three phase transformer connections.

Polarity test: Necessity: the polarity of any given terminal of the primary winding is determined by the supply voltage and changes after every half cycle. The instaneous polarity of the terminals of secondary is determined by the direction of flux and has therefore, some direction relative to that of primary terminals. For 1-phase working of transformer it is not necessary to determine the polarity, but when two single- phase transformers are to be connected in parallel or for poly-phase operation, it is necessary to determine the relative polarities of the terminals and mark them.

PROCEDURE: - (1) Connect the circuit diagram as shown below.

(2) Note the voltmeter reading.

Ckt. Diagram:

220 Volt 50 Hz Supply — E_1 E_2 — V
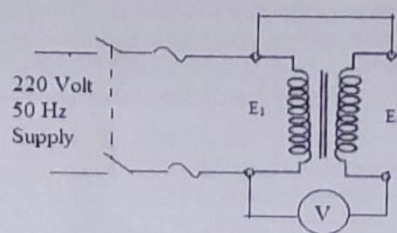
Conclusion: At no-load the induced voltages. if the voltmeter is connected between the same polarities of primary and secondary, it will read $(E_1 - E_2)$, else it will read $(E_1 + E_2)$.

Theory of 3-phase transformer connection:

1. Primary in star and secondary in star.
2. Primary in star and secondary in delta.
3. Primary in delta and secondary in delta.
4. Primary in delta and secondary in star.

For a ratio of turn's n and primary line voltage V, the various phase and line voltages will be as shown.

Primary connection	Secondary connection	Primary voltages						Secondary voltages					
		V_{12}	V_{23}	V_{31}	V_{1N}	V_{2N}	V_{3N}	V_{AB}	V_{BC}	V_{CA}	V_{AN}	V_{BN}	V_{CN}
Star	Star	V	V	V	$V/\sqrt3$	$V/\sqrt3$	$V/\sqrt3$	V/n	V/n	V/n	$V/n\sqrt3$	$V/n\sqrt3$	$V/n\sqrt3$
Star	Delta	V	V	V	$V/\sqrt3$	$V/\sqrt3$	$V/\sqrt3$	$V/n\sqrt3$	$V/n\sqrt3$	$V/n\sqrt3$	-	-	-
Delta	Delta	V	V	V	-	-	-	V/n	V/n	V/n	-	-	-
Delta	Star	V	V	V	-	-	-	V/n	V/n	V/n	$V/n\sqrt3$	$V/n\sqrt3$	$V/n\sqrt3$

Contd. (study of 3-ph. Transformer connections.

Procedure:

1. Connect the ckt. Diagram.
2. Measure the voltages and phase voltages and tabulate as showen below.
3. Connect the primary in star and secondary in delta. Insert a voltmeter in the delta
   (a) Connect the primary neutral to the supply neutral and note the voltmeter reading.
   (b) Do not connect the primary neutral and note the voltmeter reading.

y-y
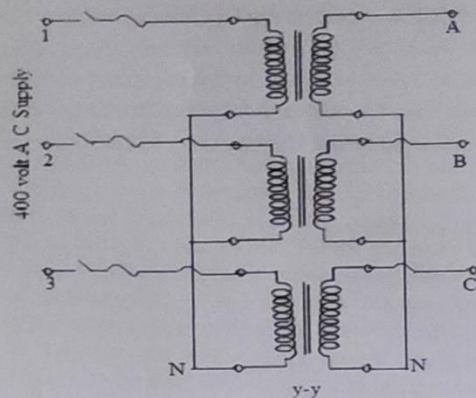
Mode of connection		Primary voltages						Secondary voltages					
Primary	Secondary	V_{12}	V_{23}	V_{31}	V_{IN}	V_{2N}	V_{3N}	V_{AB}	V_{BC}	V_{CA}	V_{AN}	V_{BN}	V_{CN}
Star	Star												
Star	Delta												
Delta	Delta												
Delta	Star												

Precautions: (1) For primary connected in star, use 400V A.C. supply and for primary connected in delta, use

230VA.C.supply.

(2) for delta connection (primary or secondary) before connecting the supply check whether

terminals have been connected.

Questions: (1) if two 1-phase transformers are connected in ipen delta, i.e. V connection, what will be the

Capacity of the V. Connection in terms of the combined capacities of the two units for the same

heating effect?

(2) Give reasons for the part of experiment explained in procedure (3)

Circuit Diagram: