

Name

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1st

Roll No.

Date

EXPERIMENT - 7

Objective - Observation of line voltage and phase voltage relation for 3-phase delta-star and delta-delta connected transformer at no load.

Apparatus Required -

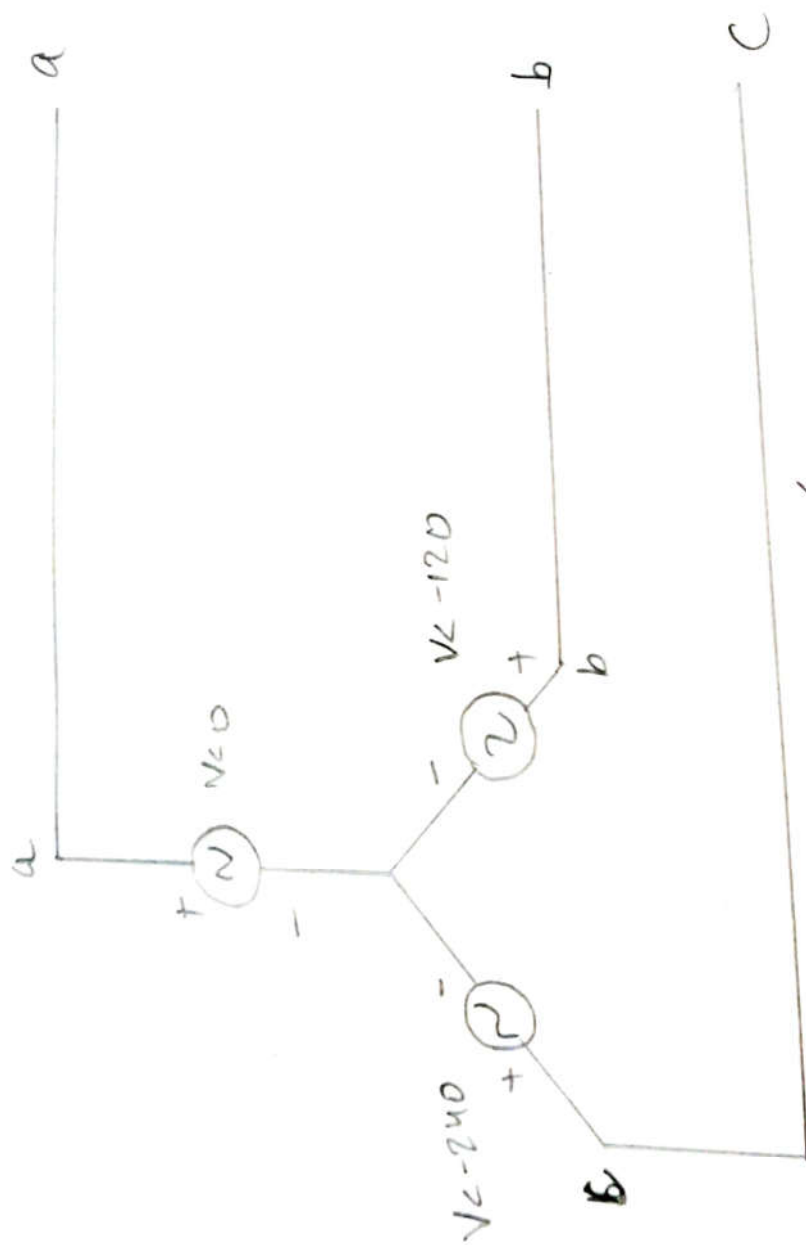
Sr. No.	Item	Rating	Quantity
1.	3-phase transformer	415/230V, 50 Hz	1
2.	voltmeter	0-500 V	4
3.	connecting leads	-	-

Theory -

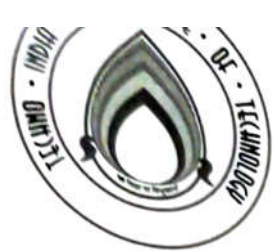
There are two types of system available in electric circuit, single phase and three phase system. In single phase circuit, there will be one phase i.e., the current will flow through only one wire and there will be one return path called neutral line to complete the circuit.

Three phase circuit is a polyphase system where three phases are sent together from the generator to the load. Each phase has a phase difference of 120° , i.e., 120° angle electrically. So from the total 360° , three phases are equally divided into 120° each. The power in three phase system is continuous as all the three phases are involved in generating the total power.

for a time duration DT.



Star connection



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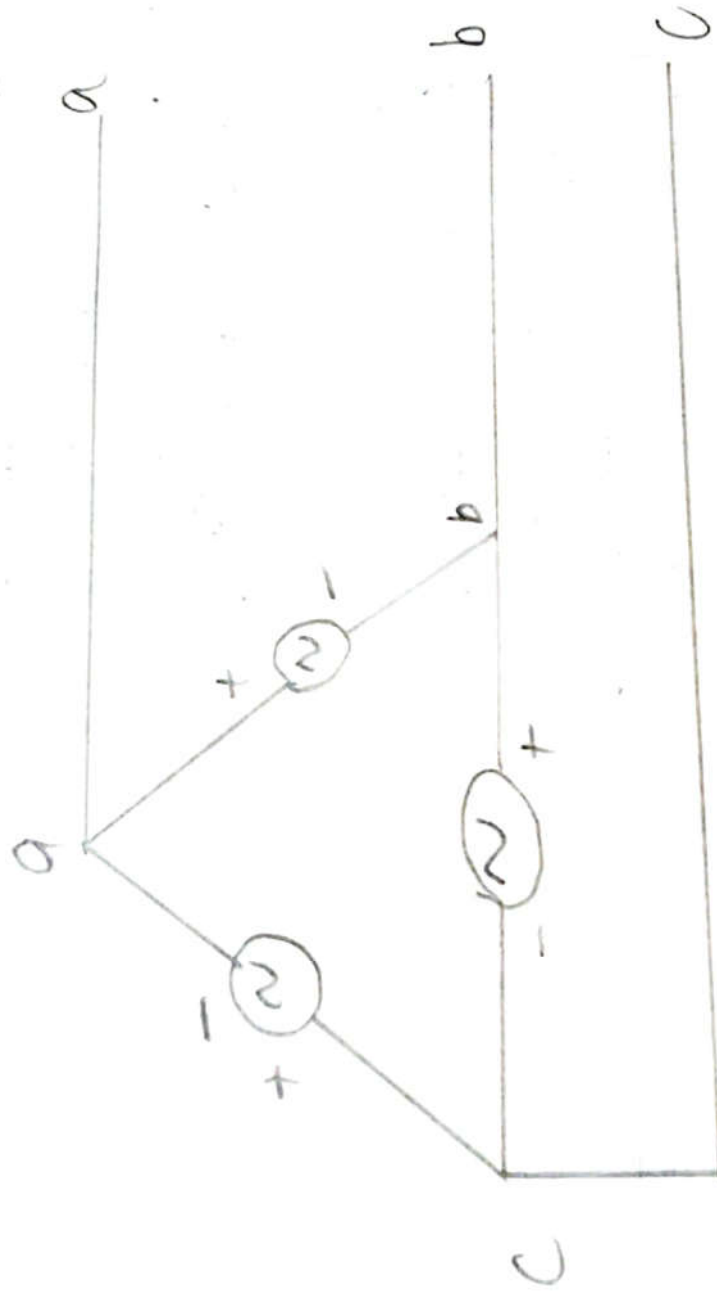
In three phase circuit, connection can be given in two types -

1. Star connection
2. Delta connection.

1. Star Connection -

In star connection, there are four wires, three wires are phase wire and fourth is neutral wire which is taken from the star point. Star connection is preferred for long distance power transmission because it is having the neutral point. In this we need to come to the concept of balanced & unbalanced current in power system.

When equal current will flow through all the three phases, then it is called as balanced current. And when the current will not be equal in any of the phase, then it is unbalanced current. In this case, during balanced condition there will be no current flowing through the neutral line & hence there is no use of the neutral terminal. But when there will be unbalanced current flowing in the three phase circuit, neutral is having a vital role. It will take the unbalanced current through to the ground and protect the transformer. Unbalanced current affects transformer and it may also cause damage to the transformer and for this star connection is preferred for long distance transmission. In star connection the line voltage is $\sqrt{3}$ times of phase voltage. Line voltage is the voltage b/w



Delta connection



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Two phases in three phase circuit and phase voltage is the voltage b/w one phase to the neutral line. And the current is same for both line and phase.

$$\Rightarrow E_{\text{line}} = \sqrt{3} E_{\text{phase}}$$

$$\Rightarrow I_{\text{line}} = I_{\text{phase}}$$

2. Delta connection -

In delta connection, there is three wires alone and no neutral terminal is taken. Normally delta connection is preferred for short distance due to the problem of unbalanced current in the circuit. In the load station, ground can be used as neutral path if required.

In delta connection, the line voltage is the same as that of phase voltage. And the line current is $\sqrt{3}$ times of phase current.

$$\Rightarrow E_{\text{line}} = E_{\text{phase}}$$

$$\Rightarrow I_{\text{line}} = \sqrt{3} I_{\text{phase}}$$

In a three-phase circuit, star & delta connection can be arranged in four diff. ways:-

1. Star - star connection
2. Star - Delta connection
3. Delta - star connection

• Observation Table -

Connection type	Primary		Secondary	
	V_L	V_P	V_L	V_P
1. Delta - Delta	424	424	136	136
2. Delta - Star	424	423	240	137

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4.

Delta - Delta connection.

But the power is independent of the circuit arrangement of the three phase system. The net power in the circuit will be same in both star and delta connection. $\frac{1}{2}$

$$P_{\text{Total}} = 3 \times E_{\text{phase}} \times I_{\text{phase}} \times \text{P.F.}$$

Result -

We have observed the line voltage and phase voltage relation for 3-phase delta-star and delta-delta connected transformers at no load.

~~Reason~~
25/11/22