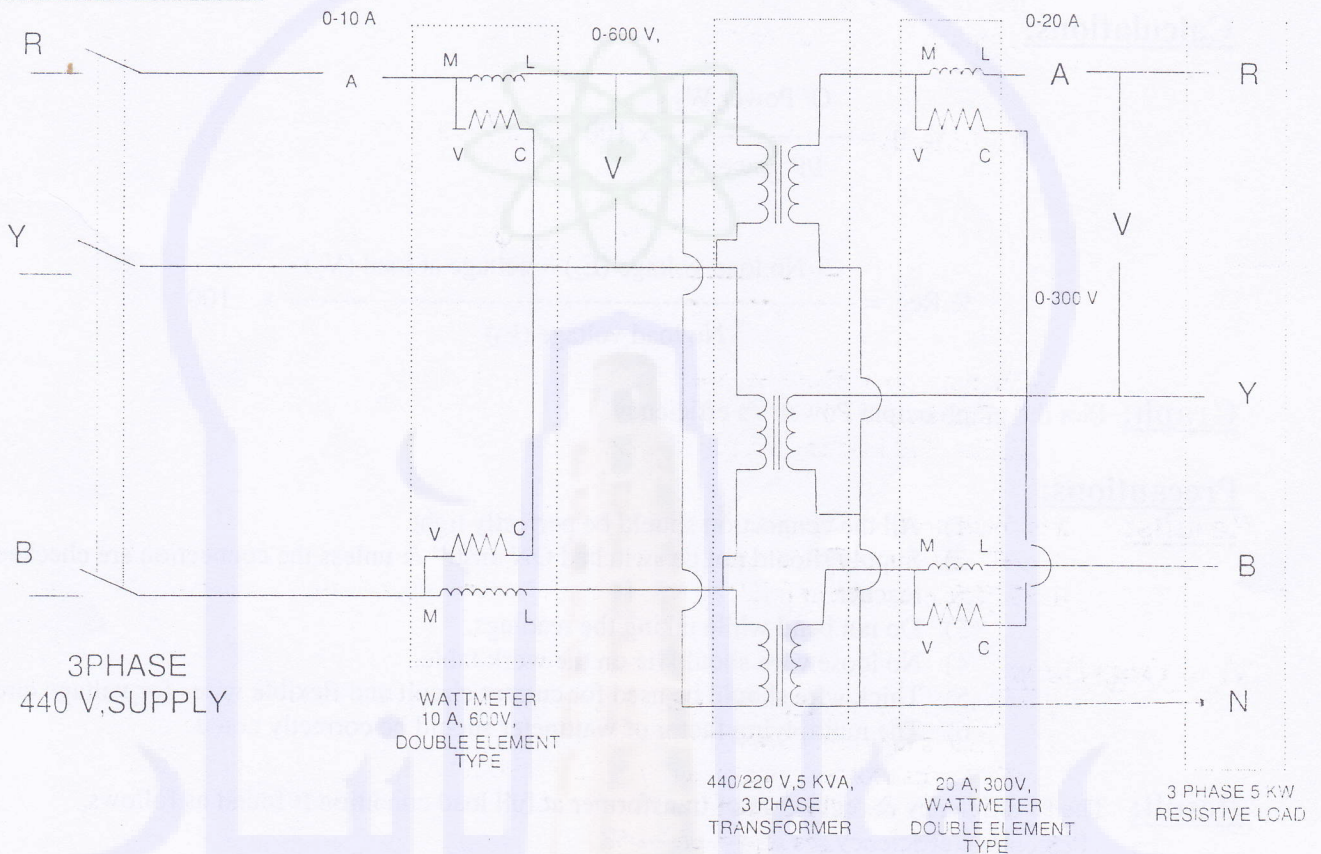


## REGULATION &amp; EFFICIENCY

## OF THREE – PHASE TRANSFORMER BY DIRECT LOADING

Apparatus:

- Ammeter :- ( 0-10A), (0-20A) AC, each 1 Nos.  
 Voltmeter :- (0-300 V), (0-600 V) AC each 1 No.  
 Wattmeter :- Two element type, (300 V, 20 A), (600 V, 10 A)  
 Dimmerstat :- 3 $\phi$  AC 10Amp ,1 Nos.  
 Transformer :- ( 440/220 V, 5 kVA) 3 $\phi$   
 Resistive Load, Connecting Wires etc.

Circuit Diagram:Theory:

It should cover the following.

- 1) Brief explanation about connection diagram
- 2) Efficiency and regulation.
- 3) Effect of load variation on efficiency and regulation.
- 4) Advantages/disadvantages of direct loading method.
- 5) Formula for calculating rated current on both sides.

Procedure:

- 1) Connect the circuit as shown in figure.
- 2) Keep load on transformer at off position.
- 3) Keeping dimmer stat at zero position, switch on 3- $\phi$  supply.
- 4) Now increase dimmer stat voltage for 440 V.
- 5) Note down the no-load readings.

- 6) Then increase the load in steps till rated current of the transformer & note down corresponding readings. Take atleast 8 readings.
- 7) Calculate efficiency & regulation for each reading.

### Observation Table:

No-load secondary voltage  $E_2 = \text{-----}$  Volts

Sr.No.	$I_1$ Amp	$V_1$ Volts	$W_1$ Watts	$I_2$ Amp	$V_2$ Volts	$W_2$ Watts	% Reg	% $\eta$
1								
2								
3								
4								
5								

### Calculations:

$$\% \eta = \frac{\text{O/P Power } W_2}{\text{I/P power } W_1} \times 100$$

$$\% \text{ Reg} = \frac{\text{No load voltage } (E_2) - \text{voltage at load } (V_2)}{\text{No load voltage } (E_2)} \times 100$$

Graph: Plot the graph output Power Vs efficiency.

### Precautions:

- 1) All the connection should be perfectly tight.
- 2) Supply should not be switched ON until & unless the connection are checked by the teacher.
- 3) Do not bend while taking the readings.
- 4) No loose wire should lie on the work-table.
- 5) Thick wire should be used for current circuit and flexible wires for voltage circuits.
- 6) The multiplying factor of wattmeter should be correctly noted.

Result: The % efficiency & regulation of transformer at full load condition is found as follows.

Percentage efficiency = -----%

Percentage regulation = -----%

Conclusion: Transformer efficiency initially increases as the load on transformer is increased. After maximum efficiency if we increase the load further, the efficiency of transformer reduces. Also terminal voltage reduces as the load is increased.

### Viva Questions:

1. What is the condition for max efficiency?
2. What is the condition for zero voltage regulation?
3. Which is the other method of finding efficiency and regulation?
4. Draw phasor diagram of transformer at full load and 0.5 p.f. lagging.
5. Draw phasor diagram of transformer at full load and 0.5 p.f. leading.
6. What is the normal nature of output power Vs efficiency curve & why?