(A)OPEN CIRCUIT AND SHORT CIRCUIT TEST ON A 1- Ø TRANSFORMER

(B)LOAD TEST ON 1- Ø TRANSFORMER

Exp no: 5 Date

5(A) OPEN CIRCUIT AND SHORT CIRCUIT TEST ON A 1- Ø TRANSFORMER

Aim: (A) To determine the efficiency and regulation of a 1-Ø transformer by conducting open circuit test and short circuit test and to draw equivalent circuit.

Apparatus required:

S.no	Name of the Apparatus	Range	Type	Quantity
1.	Ammeter	(0-5,10)A	MI	1
2.	Volt meter	(0-150,300)V	MI	1
3.	Wattmeter	300V, 5A	EDM	1
		150 V,20A	EDM	1
4.	Connecting wires	2.5sq.mm	Copper /Aluminum	Few

Name plate details:

Precautions:

1. Auto Transformer should be in minimum voltage position at the time switching on the supply
2. Before switching off the supply the auto transformer should bring up to zero position.

Procedure:

OPEN CIRCUIT TEST:

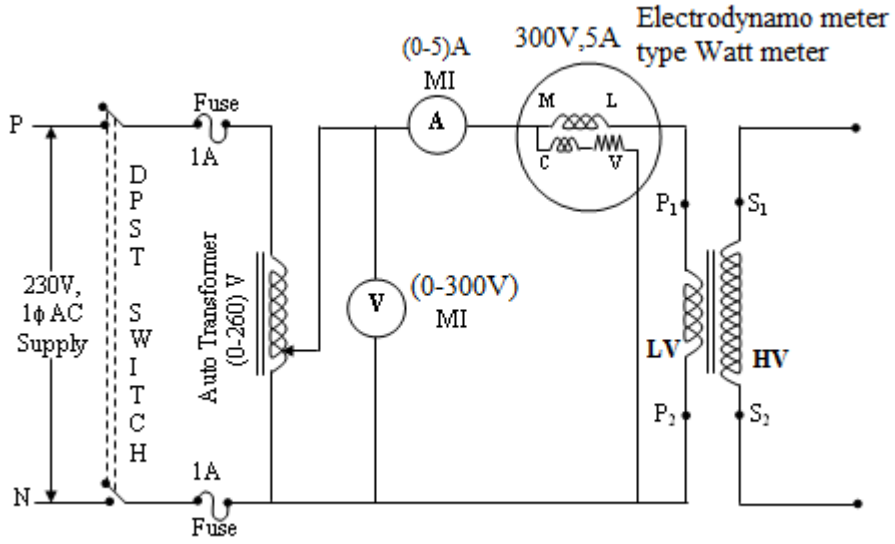
1. Connections are made as per the circuit diagram.
2. After checking the minimum position of Autotransformer, DPST switch is closed.
3. Auto transformer variac is adjusted get the rated primary voltage.
4. Voltmeter, Ammeter and Wattmeter readings on primary side are noted.
5. Auto transformer is again brought to minimum position and DPST switch is opened.

SHORT CIRCUIT TEST:

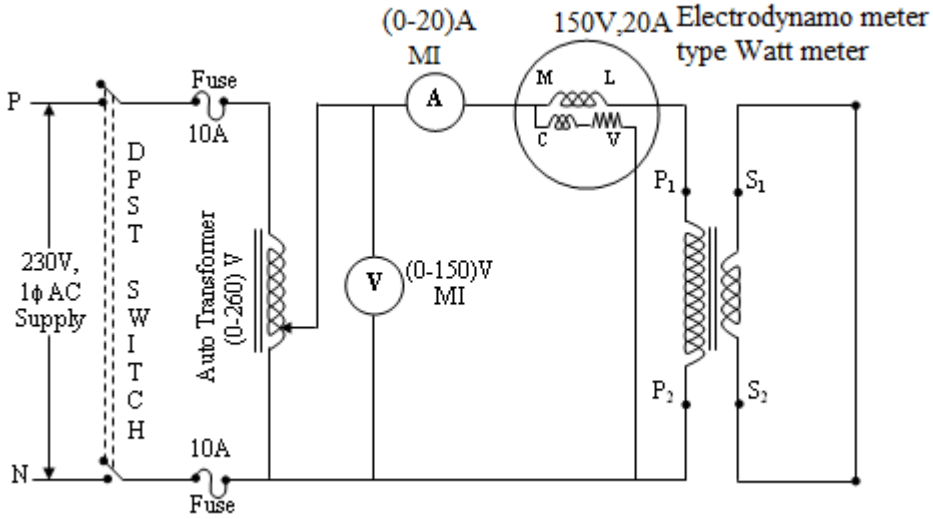
1. Connections are made as per the circuit diagram.
2. After checking the minimum position of Autotransformer, DPST switch is closed.
3. Auto transformer variac is adjusted get the rated primary current.
4. Voltmeter, Ammeter and Wattmeter readings on primary side are noted.
5. Auto transformer is again brought to minimum position and DPST switch is opened.

Circuit diagram:

Open Circuit test:



Short circuit test:



Observation Tables:

Open Circuit test:

Vo	Io	Wo

Short circuit test:

Vsc	Isc	Wsc

Formulae used:

Core loss: $W_o = V_o I_o \cos\phi_o$

$$\cos\phi_o = \frac{W_o}{V_o I_o} \qquad \phi_o = \cos^{-1}\frac{W_o}{V_o I_o}$$

$I_\omega = I_o \cos\phi_o$ (Amps) $\qquad I_\mu = I_o \sin\phi_o$ (Amps)

$$R_o = \frac{V_0}{I_\omega}\ \Omega \qquad X_o = \frac{V_0}{I_\mu}\ \Omega$$

$$R_{o2} = \frac{W_{sc}}{I_{sc}^2}\ \Omega \qquad Z_{o2} = \frac{V_{sc}}{I_{sc}}\ \Omega \qquad X_{o2} = (Z_{02} - R_{o2}^2)^{1/2}$$

$$R_{o1} = \frac{R_{02}}{K^2}\ \Omega \qquad X_{o1} = \frac{X_{02}}{K^2}\ \Omega \qquad K = \frac{V_2}{V_1} = \text{Turns Ratio or Transformation ratio}$$

Percentage efficiency (% η) $= \frac{x Q \cos\Phi}{x Q \cos\Phi + \text{iron losses} + \text{copper losses}} \times 100$

Percentage Regulation (%Reg) $= \frac{xIsc(R_{02}\cos\emptyset \pm X_{02}\sin\emptyset)}{V_2} \times 100$ or $\frac{xIsc(R_{01}\cos\emptyset \pm X_{02}\sin\emptyset)}{V_1} \times 100$

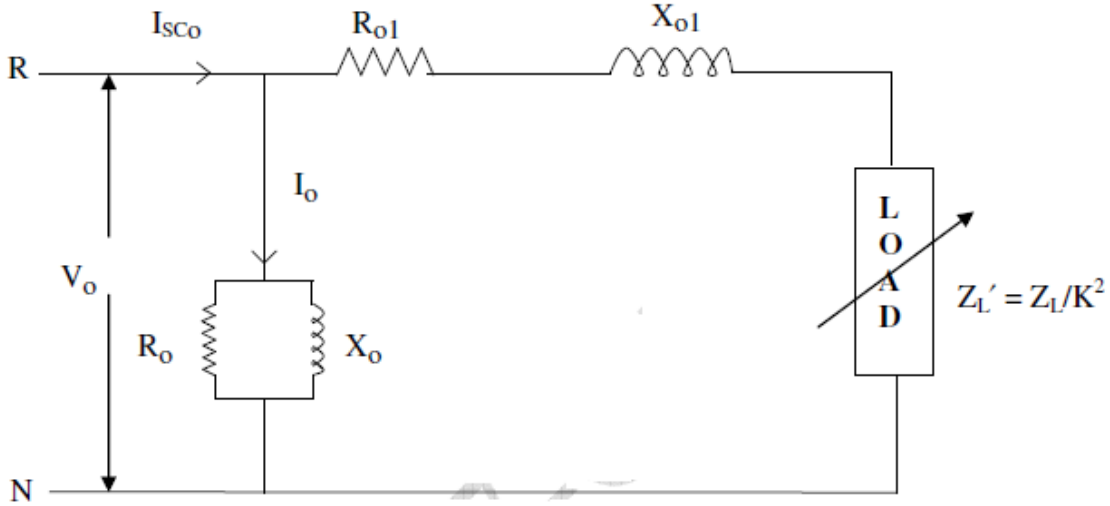
\+ For lagging power factor

\- For leading power factor

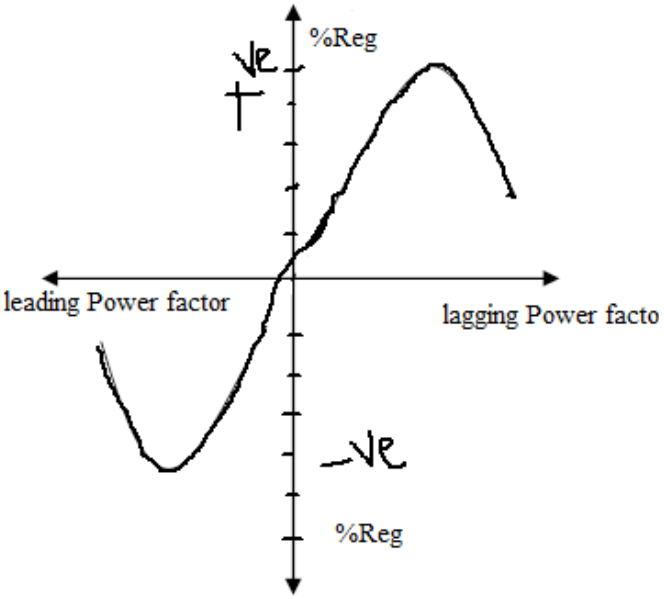
Where Q= KVA rating of the transformer

x is the load and it is 1 for full load,1/2 for half load,1/4 for quarter load etc.. And power factor is in unity,0.8 lag,0.8 lead etc…

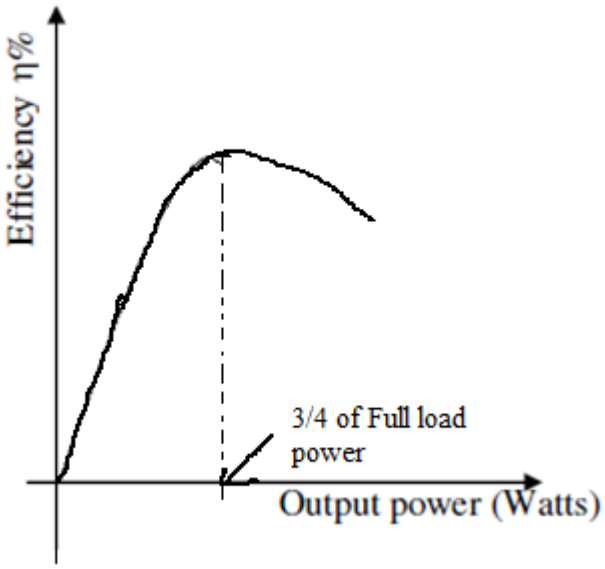
Equivalent circuit diagram



Model Graphs:



Regulation Curve



Efficiency Curve

Result:

5(B)Load test on 1-Ø Transformer

Aim: To determine the efficiency and voltage regulation of a single phase transformer by load test.

Apparatus Required:

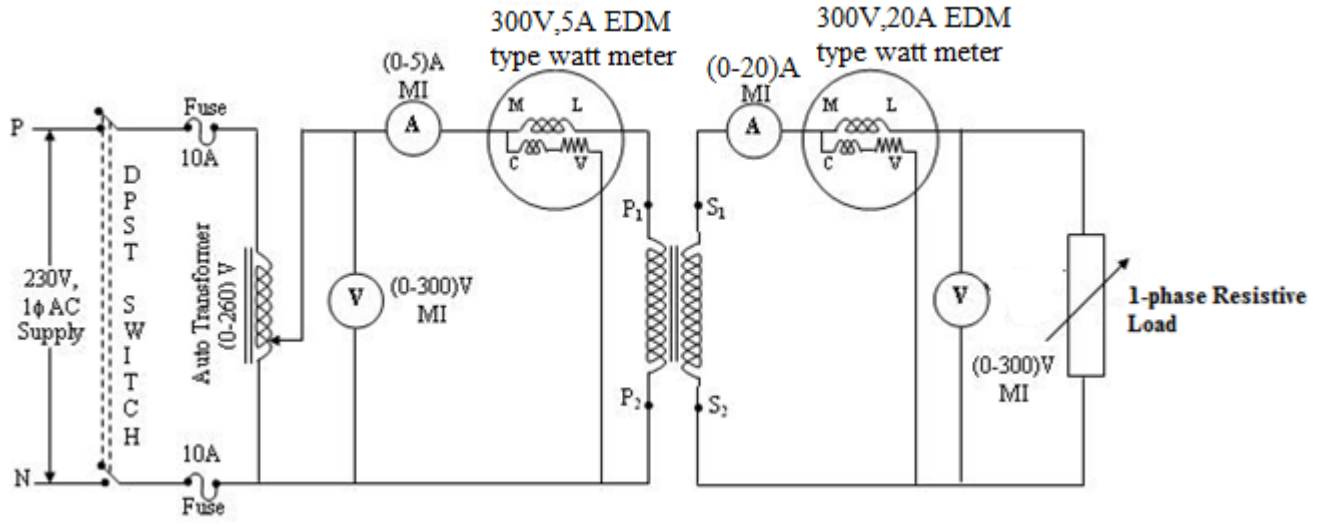
S.no	Name of the Apparatus	Range	Type	Quantity
1.	1-phase Transformer	--	--	1
2.	1-phase Auto Transformer	(0-300V) Variable		1
3.	1-Phase Resistive Load	5KW,230V	Resistive	1
4.	Ammeter	(0-5)A	MI	1
5.	Volt meter	(0-300)V	MI	1
6.	Wattmeter	300 V, 10A	EDM Type	1
7.	Connecting wires	2.5sq.mm	Copper /Aluminum	Few

Name plate details:

Procedure:

1. Connections are made as per the circuit diagram.
2. After checking the no load condition, minimum position of auto transformer and DPST switch is closed.
3. Ammeter, Voltmeter and Wattmeter readings on both primary side and secondary side are noted.
4. The load is increased and for each load, Voltmeter, Ammeter and Wattmeter readings on both primary and secondary sides are noted.
5. Again no load condition is obtained and DPST switch is open.

Circuit Diagram:



Observation Table:

S.no	Load Current	Primary			Secondary			%Efficiency (Output power/Input power)*100	% VR
		V_1(Volts)	I_1(Amps)	V_1(Volts)	V_2(Volts)	I_1(Amps)	W_1(Watts)		

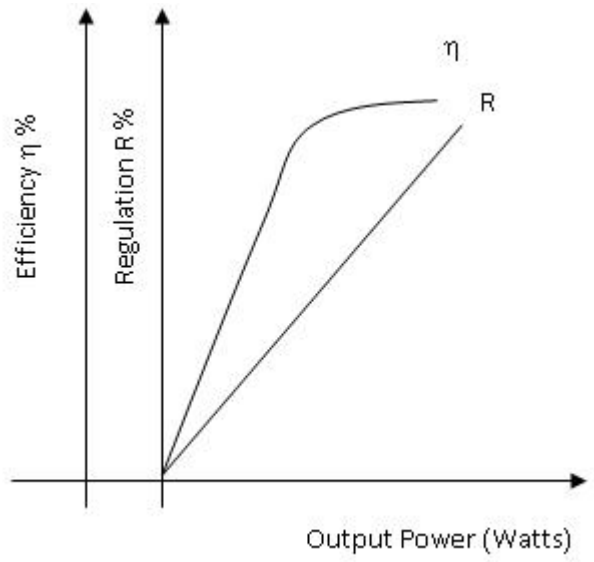
Formulae used:

Output Power = W_2 x Multiplication factor

Input Power = W_1 x Multiplication factor

$$\%VR=\frac{Vnl - Vfl\ (Secondary)}{Vnl} x\ 100$$

Model Graph:



Result: