SUMPNERS TEST ON 1-Ø TRANSFORMERS

Exp no: 8 Date

Aim: To determine the efficiency and regulation of a given single phase Transformer by conducting back-to-back test and also to find the parameters of the equivalent circuit.

Apparatus required:

S.no	Name of the Apparatus	Range	Type	Quantity
1.	Auto transformers	0-260V	Variable	2
2.	Ammeter	(0-5,20)A	MI	1
3.	Volt meter	(0-300,600)V	MI	1
4.	Wattmeter	300V, 5A	EDM	1
		600V,20A	EDM	1
5.	Connecting wires	2.5sq.mm	Copper /Aluminum	Few

Name plate details:

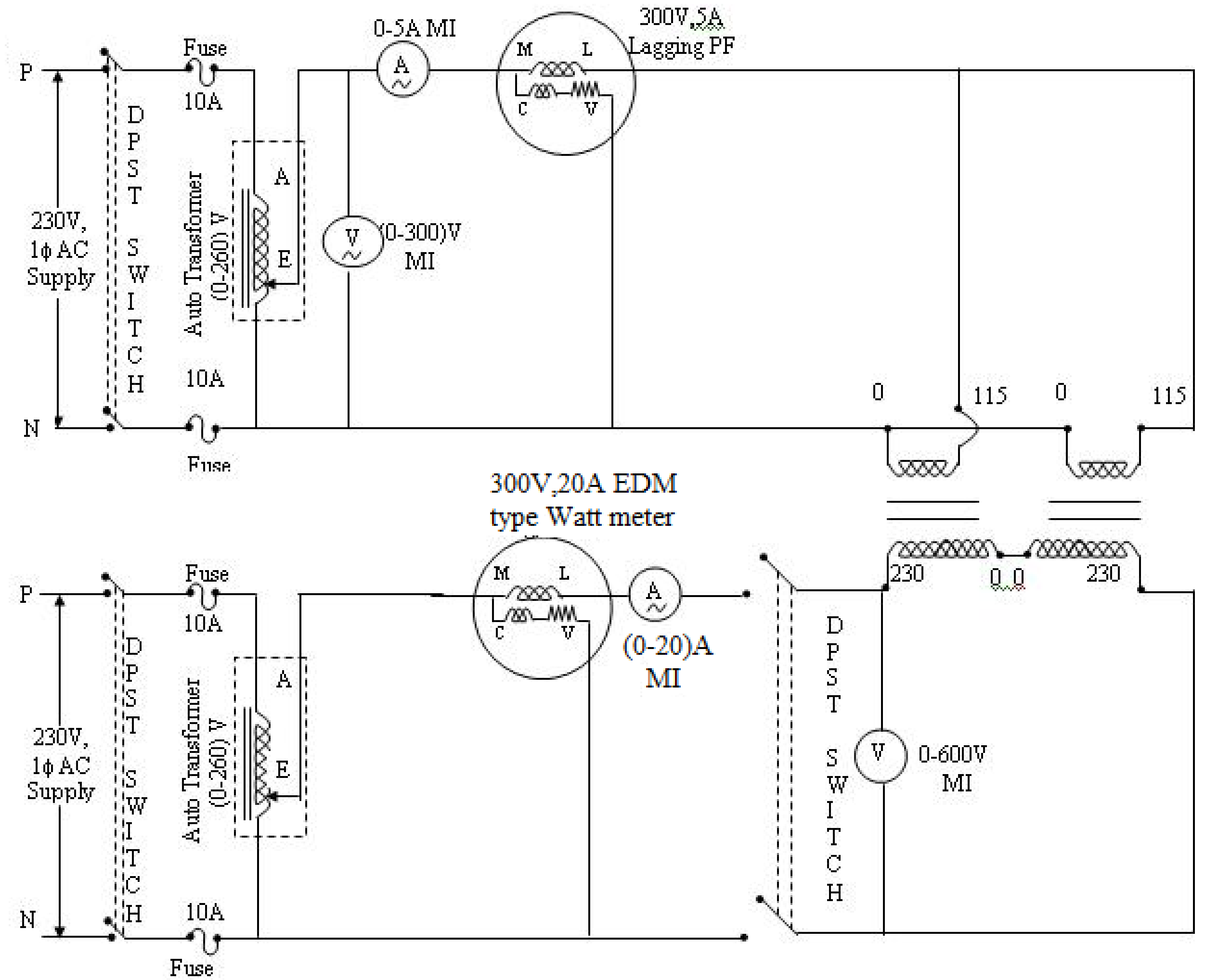
Precautions:

1. Auto Transformer knob should be in zero position, before switching on the ac supply.
2. Transformer should be operated under rated values.

Procedure:

1. Connections are made as shown in the circuit diagram.
2. Rated voltage of 115V is adjusted to get in voltmeter by adjusting the variac of the Auto Transformer which would be in zero before switching on the supply at the primary side.
3. The readings of voltmeter, ammeter and wattmeter are noted on the primary side.
4. A voltmeter is connected across the secondary and with the secondary supply off i.e switch S is kept open. The voltmeter reading is noted.
5. If the reading of voltmeter reads higher voltage, the terminals of any one of secondary coil is interchanged in order that voltmeter reads zero.
6. The secondary is now switched on and SPST switch is closed with variac of auto transformer is zero.
7. After switching on the secondary the variac of transformer (Auto) is adjusted so that full load rated secondary current flows.
8. Then the readings of wattmeter, Ammeter and voltmeter are noted.
9. The Percentage Efficiency and percentage regulation are calculated and equivalent circuit is drawn.

Circuit diagram:



Observation Tables:

SI No	Primary Voltage (V)	W1 (W)	W2(W)	Secondary Current(A)

Formulae used:

Core loss of each transformer Wo=W1/2

Full load copper loss of each transformer W_c = W2/2 Watts.

$$W_o = V_1 I_1 \cos \varphi_o \qquad \varphi_o = \cos^{-1} \frac{W_o}{V_1 I_1} \qquad I_1 = \frac{I_o}{2} \text{ A}$$

$Iw = I_1 \cos\Phi o$ $I\mu = I_1 \cos\Phi$ $V2 = Vs/2 \times A$

$Ro = V_1 / Iw$ $Xo = V_1 / I\mu$ $R_{o2} = Wc / I2^2$ $Z_{o2} = V_2 / I_2$

$Xo_2 = \sqrt{Zo_2^2 - Ro_2^2}$

Copper loss at various loads = $I_2^2 Ro_2$

Regulation

1. Upf : $I_2 / V (Ro_2 \cos\Phi o) \times 100$
2. Lagging pf : $I_2 / V (Ro_2 \cos\Phi o + Xo_2 \sin\Phi o) \times 100$
3. Leading pf : $I_2 / V (Ro_2 \cos\Phi o - Xo_2 \sin\Phi o) \times 100$

Output Power (1) Upf : 3Kw
(2) Pf : 3Kw CosΦo

Input Power = Output Power + Core loss + Cu loss

$$\text{Efficiency } \eta\% = \frac{\text{Output power}}{\text{Input Power}} \times 100\%$$

Result: