DEPARTMENT OF ELECTRICAL ENGINEERING
EE 19001 FIRST YEAR E.T. LAB
Experiment No. – 5

SINGLE PHASE TRANSFORMER

OBJECT:

To determine the efficiency and regulation of a single phase transformer by conducting:

(a) Open Circuit test;

(b) Short Circuit test;

(a) OPEN CIRCUIT TEST:

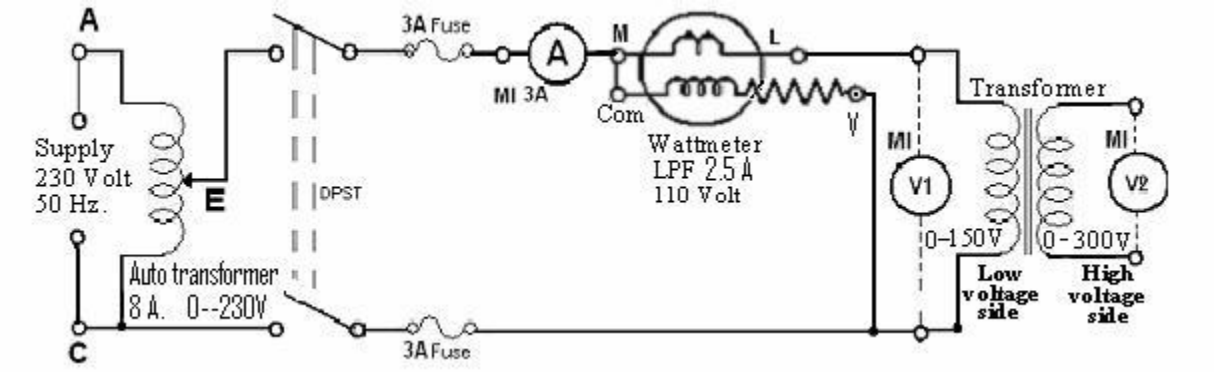

Fig. 1 Circuit diagram for Open Circuit test of a transformer

INDIVIDUALLY note the **complete** name-plate data/information of the motor/transformer that is/are required for the experiment and **obtain the signature of the teacher before the start of the experiment**. It must also be confirmed that the fuse/meter ratings being used are suitable.

PROCEDURE:

i) Note the transformer ratings;

ii) Connect the circuit as shown in Fig- 1 choosing suitable instruments;

iii) Note: supply is connected to the Low-Voltage side of the transformer-under-test;

iv) Set the autotransformer output to zero. Switch on the supply. Increase the voltage, in steps, up to rated voltage of the LV side and tabulate in Table no. 1 the no load current, (Primary Current, I_1), input power, P_1 and the primary & secondary voltages, V_1 and V_2, corresponding to each value of the applied voltage.

Table no. 1 Open Circuit test

Sl. No.	Primary Voltage V_1 L. V. side (V)	Primary Current I_1 (I)	Input Power P_1 (W)	Secondary Voltage V_2 H. V. side (V)

(b) SHORT CIRCUIT TEST:

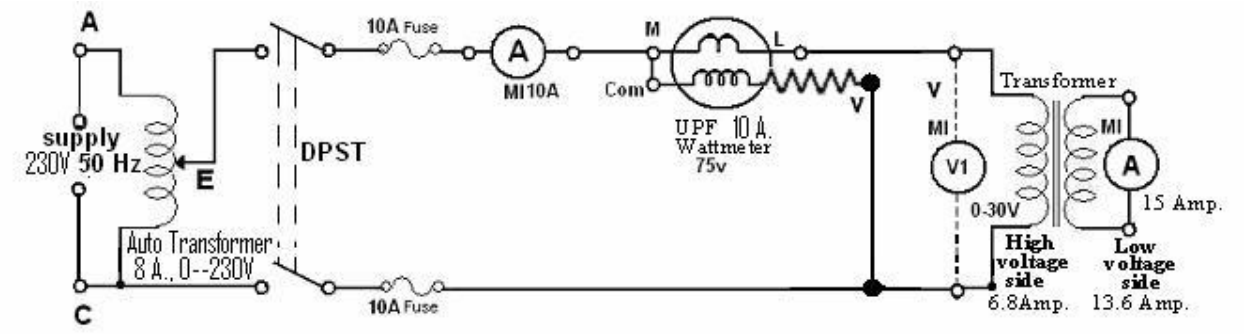

Fig. 2 Circuit diagram for Short Circuit test of a transformer

PROCEDURE:

i) Connect the circuit as shown in Fig- 2, choosing instruments of ranges suitable to go up to the rated current.

ii) Set the autotransformer output to zero. Switch on the supply. Increase the voltage, in steps, **slowly,** and observe the primary and secondary currents. (Note: The current flowing through the any of the windings must not exceed their rated levels.)

iii) Adjust the output voltage of the autotransformer to get secondary short circuit current of 25%, 50%, 75% and 100% of the rated current of the LV side. Note down in Table no. 2 the value of the input voltage, V_1, primary current (HV side) I_1, input power, P_1 and the secondary current, I_2 (LV side).

Table no. 2 Short Circuit test

Sl. No.	Primary Voltage V_1 H. V. side (v)	Primary Current I_1 (I)	Input Power P_1 (w)	Secondary Current I_2 L. V. side

RESULTS:

From the observations of the open circuit test:

i) Plot no load current (refer to L.V side) and power input Vs applied voltage on a graph paper.

ii) Calculate the parallel branch parameters of the equivalent circuit of the transformer referred to L.V side.

From the observations of the short circuit test:

iii) Calculate the equivalent circuit series parameters of the transformer with respect to **H.V**. side.

Finally determine the following:

i) Complete equivalent circuits of the transformer referred to both H.V. & L.V. side.
ii) Efficiency of the Transformer at 25%, 50%, 75%, & 100% of the full load current at unity p.f.
iii) Full load regulation at power factor of (a) 1.0 (b) 0.8 lagging and (c) 0.8 leading.
iv) A graph showing efficiency at unity p.f. against load current at rated voltage.
v) The maximum efficiency at the load (at unity p.f.) at which the maximum efficiency has occurred from the graph.

Discussion:

1). Why is OC test carried out by energising LV side?

2). Why is SC test carried by energising side?

3). When is the efficiency maximum for a transformer?

4). Why does no-load losses arise in a transformer?

References:

HUGHES: Electrical Technology.

NAGARTH & KOTHARI: Electrical Machines.

M.G.Say: AC Machine.

A.S.Langsdorf: Theory of Alternating Current Machinery.