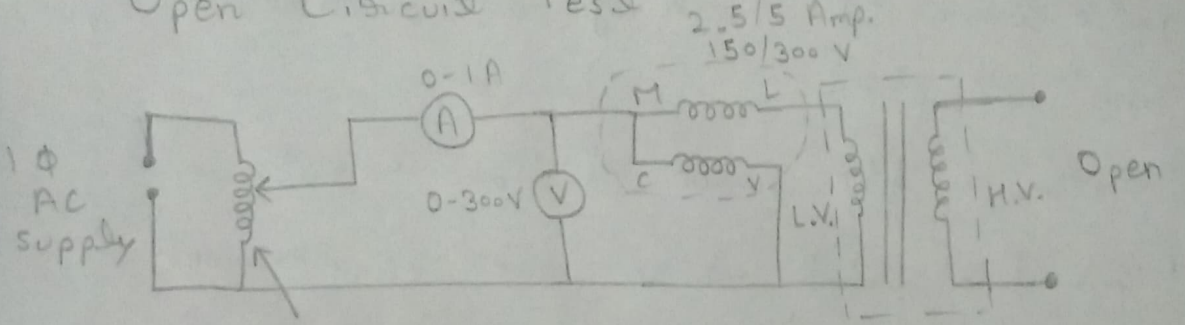
Circuit Diagram :-

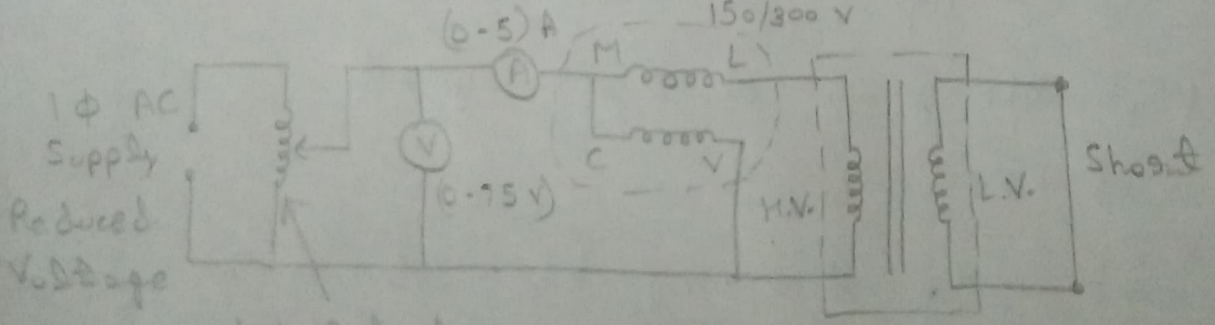
Open Circuit Test



1φ Auto transformer (0-300 V)

1φ transformer 230/115 V, 1 KVA

Short Circuit Test



1φ Auto transformer

1φ transformer 1 KVA, 230/115 V

Object :- To determine efficiency and regulation of a 1-ϕ transformer by open-circuit and short-circuit test.

Apparatus Used :-

• 1-ϕ Transformer	1 KVA	1 No.
• 1-ϕ Auto transformer	0-300 V	1 No.
• Ammeter	(0-1) Amp.	1 No.
• Ammeter	(0-5) Amp.	1 No.
• Voltmeter	(0-75 V) & (0-300 V)	1 No.
• Wattmeter	2.5/5 Amp. (0-150/300) V	1 No.

Theory :-

The efficiency of transformer can be calculated as-

$$\text{Efficiency } \eta = \frac{\text{Output}}{\text{Input}}$$

$$= \frac{\text{Output}}{\text{Output + Losses}}$$

$$= \left[1 - \text{losses}/(\text{Output + losses})\right]$$

When $\cos\theta = W_{sc}/I_1 V_1$

Observation Table :-

Open Circuit Test

S.No	Input Voltage V_1	No Load Current I_o	Wattmeter Reading W
1	230 V	0.52 A	5×2

Short Circuit Test

S.No	Short Circuit Voltage	Full load Current I_{sc}	Wattmeter Reading W_{sc}
1	28 V	4.3 A	10×2

Calculation :-

η is calculated as given formula

$$\eta = \frac{x\ S\cos\phi}{x\ S\cos\phi + P_i + P_c x^2}$$

where,

$P_i = W$, $P_c = W_{sc}$

S = rated V_A of the transformer

x = fraction of the full load transformer

As given transformer is fully loaded,

$\therefore x = 1$

$\because P_c = 20\ W$

$\because P_i = 10\ W$

$\because S = 1\ KVA$

$P = VI\cos\phi$

$10 = 230 \times 0.52 \times \cos\phi$

$$\cos\phi = \frac{10}{230 \times 0.52} = 0.083$$

$$\eta = \frac{1 \times 10^3 \times 0.083}{1 \times 10^3 \times 0.083 + 10 + 20 \times 1} \Rightarrow \frac{83}{113}$$

$$\boxed{\eta = 0.73}$$

Result :- Efficiency of a given 1-ϕ transformer is 0.73

Precaution :-

1) All connections should be tight
2) Under short circuit test Autotransformer should move from zero voltage.