Meter Selection (MI)

OCT

$V_0 \rightarrow 110V \rightarrow$ 0-150/300V. ✓

$I_0 \rightarrow 0.18A \rightarrow$ 0-1/2A ✓

$W_0 \rightarrow$ Ratings Prim. Voltmeter + Primar. Ammr

$V_2 \rightarrow$ 220V . 0-150/300V ✓

$W_0 \rightarrow$ 0-1/2A
0-150/300V

SCT

$V_{sc} \rightarrow 22V \rightarrow$ 0-30/60V ✓

$I_{sc} \rightarrow 9.5A \rightarrow$ 0-5/10A ✓ 0,-5A ✓

$W_{sc} \rightarrow$ 0-30/60V
0-5/10A

$I_2 \rightarrow 9A \rightarrow$ 0-10A/15A

Equivalent Ckt of 1ϕ Transformer

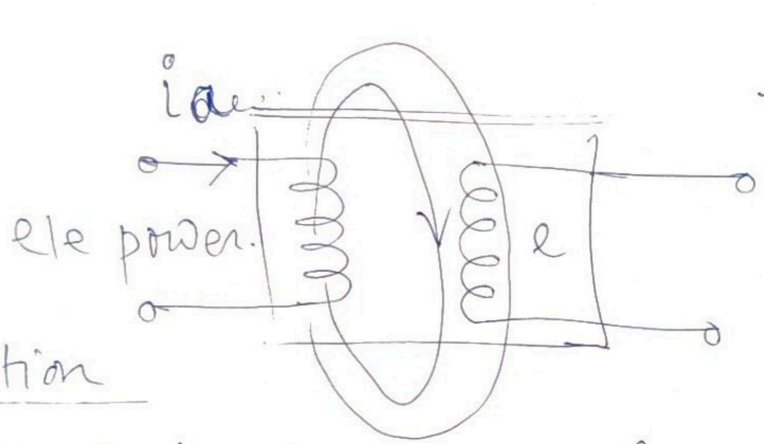
1. 1ϕ Transformers are the trans.f which deal with single phase power.

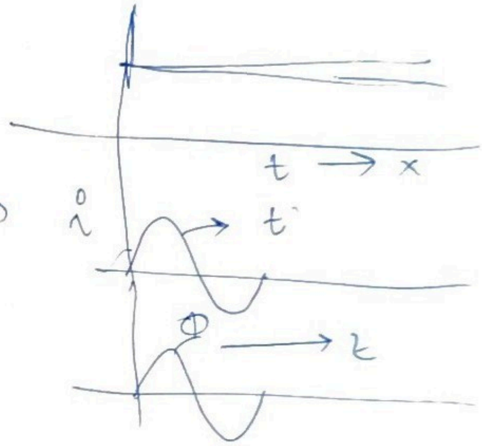
by changing the levels of V and I

f will be fixed

We need to increase V or decrease V } Requirement of P.S.

Faraday's EM Principle





Interaction

ϕ and Conductor → if we have relative motion either in time or in space.

$\Phi = \phi(t)$

$e \propto N$

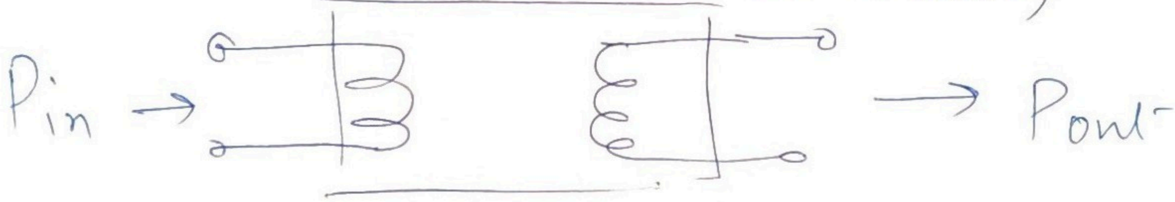
$e = 4.44\,\phi_m f N$

$e_1 = 4.44\,\phi_m f N_1$

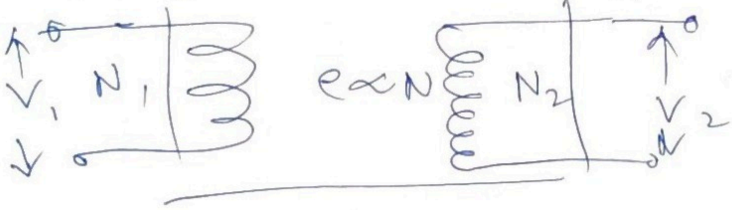
$e_2 = 4.44\,\phi_m f N_2$

Names of Windings

Primary ← depends on application → Secondary



LV ← depends on design. → HV



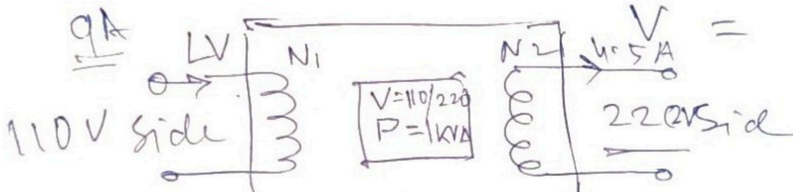
$N_2 > N_1 \Rightarrow V_2 > N_1$

Rating of Transformer

Rated Parameters. $P = 1kVA = 10^3 VA$

$V = 110/220V$

$V \propto \frac{1}{I}$



$$\boxed{P = V_1 I_1 = V_2 I_2}$$

$[\because \cos\phi = 1]$ 0.9, 0.5

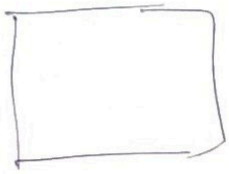
$$\underset{110}{V_{r1}} I_{r1} = \underset{220}{V_{r2}} I_{r2} = P_r = 10^3$$

$$I_{r1} = \frac{P_r}{V_{r1}} = \frac{10^3}{110} = 9.1A$$ → Rated current of LV side

$$I_{r2} = \frac{P_r}{V_{r2}} = \frac{10^3}{220} = 4.55A$$ → Rated current of HV side.

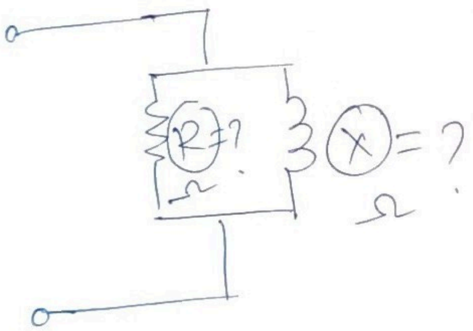
Equivalent Ckt of 1ϕ Tr.

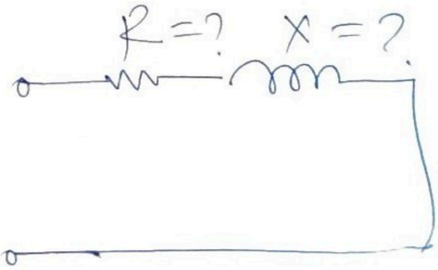
1. OCT
2. SCT



≡ combination of ele. ckt. elem.

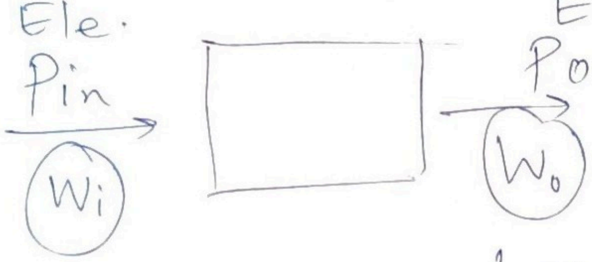
→ Equ. Ckt





OCT of 1Φ Tr.

1. To calculate the η ✓ Direct method,
2. To calculate the loss ✓ Direct method,



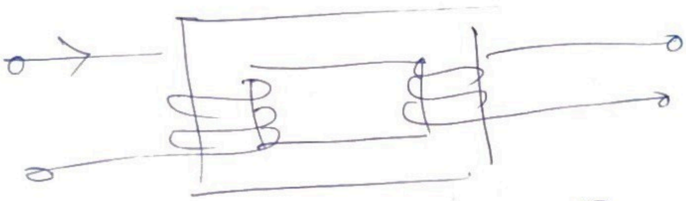
$$\eta = \frac{W_o}{W_i}$$

Loss $= W_1 - W_o$ ✓✓

1. η ✓
2. L ✓ → We get I-loss C-loss seperately
3. Equ. ckt parameter:
   OCT + SCT

Trans Losses

Perfomance of two Materials.



(1) Copper.

(2) Iron.

Copper → I flows $\xrightarrow{CL_t}$ CL → PCL $= I_1^2 R_1$; → SCL $= I_2^2 R_2$

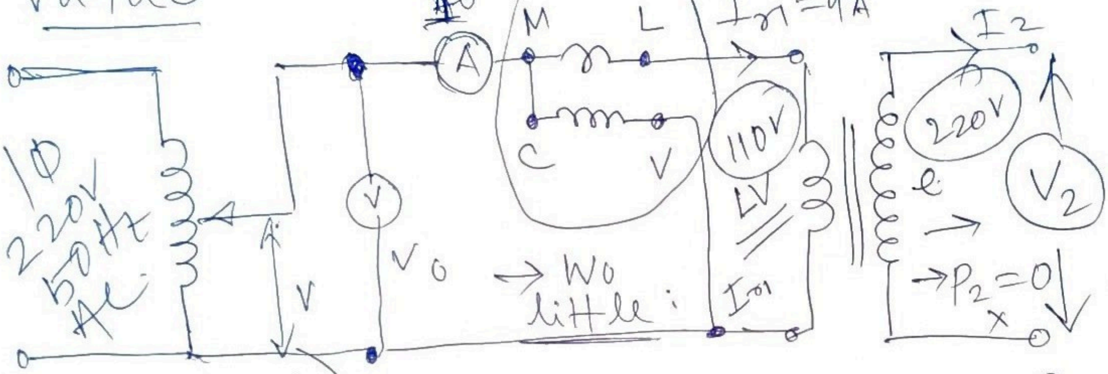
Iron → ϕ conducts → IL → Hys. ; → ECL.

IL_t = total Iron loss

OCT Ckt

1. HV → Secondary
2. HV → Open.

Variac



$Z_V = \alpha$ very large.

open ckt

$I_2 = 0$

$I_2^2 R_2 = 0$

$P_2 = V_2 I_2 = 0$

($W_0 = I L$ total)

Key ckt

$P_1 = V_1 I_1$

less $\underline{110} = I_1 =$ less.

V_0	I_0	W_0	V_2
25			
50			
75			
100			
110			220 V completed

2-3% of rated value.

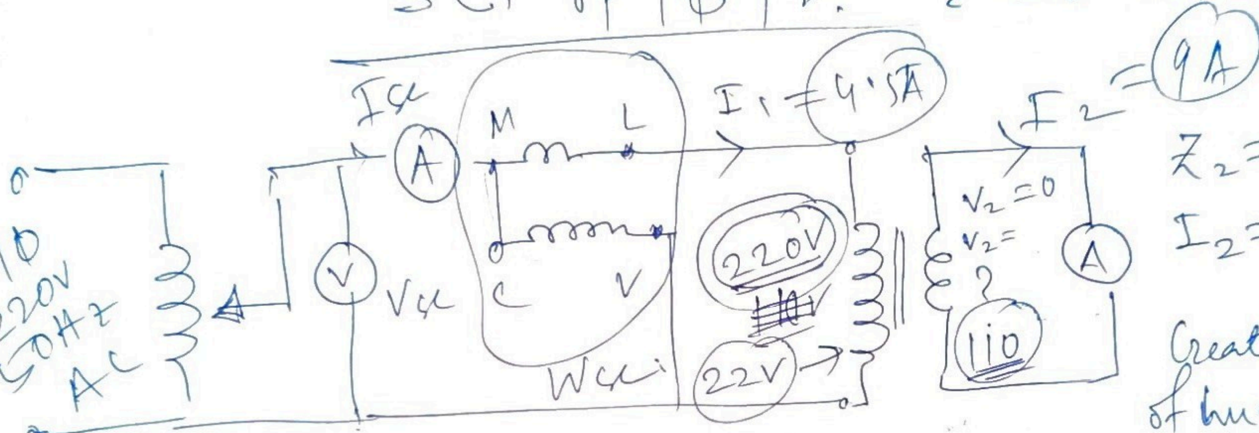
2% of 9A ($\because I_{r1} = 9A$)

$(0.18A)^2 R_1 \approx 0$

PCL = 0 SCL = 0 CL_t = PCL + SCL = 0

1. LV side → secondary
2. LV will be shorted

SCT of 1φ Tr.



$Z_2 = \to 0$

$I_2 = \frac{110}{Z_2} \approx$ HUGE

Creating ~~loss~~ heat of huge amount → will burn the tr.

10% of rated value (220V)

i.e. 22V will produce 9A at seco.

and 4.5A at prim.

W_{sc}. will be CL total.

IL → depends on voltage → SCT → No IL → IL = 0

SCT Data

Vsc	Isc	Wsc	I_2
			2A
			4A
			6A
			8A
~ 22			9.A

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SCT

$V_{sc} \rightarrow 22V \rightarrow 0-30/60V$

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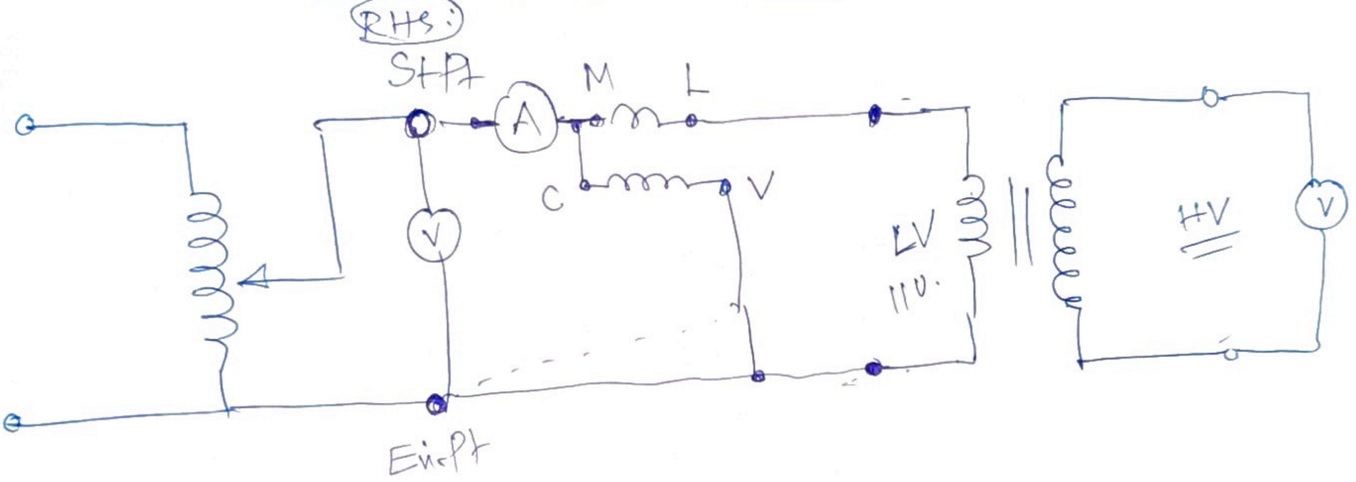
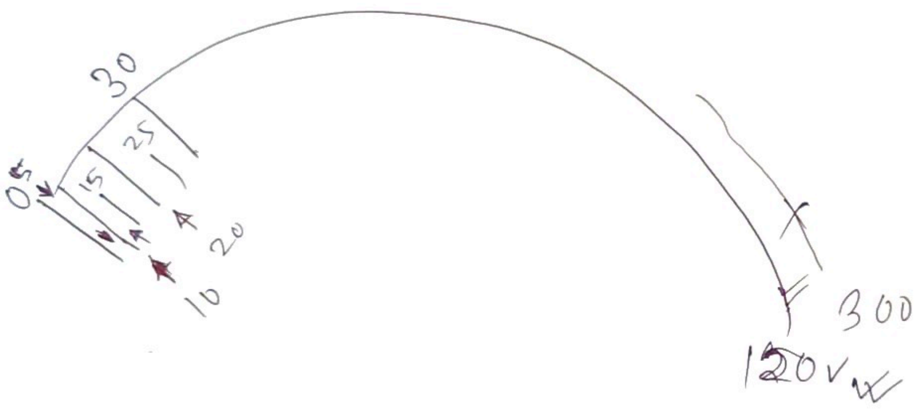
$W_{sc} \rightarrow$ $0-30/60V$, $0-5/10A$

$I_2 \rightarrow 9A \rightarrow 0-10A/15A$

Connection Procedure.



Meter Reading



Eqv. Ckt Parameter Calculation

OCT

V_0

I_0

W_0

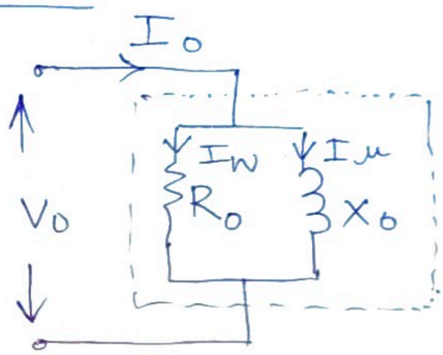
V_2

$W_0 = V_0 I_0 \boxed{\cos\phi_0}$ ✓

$\boxed{\sin\phi_0}$ is known

$I_W = I_0 \cos\phi_0$

$I_\mu = I_0 \sin\phi_0$



$I_W = I_0 \cos\phi_0$

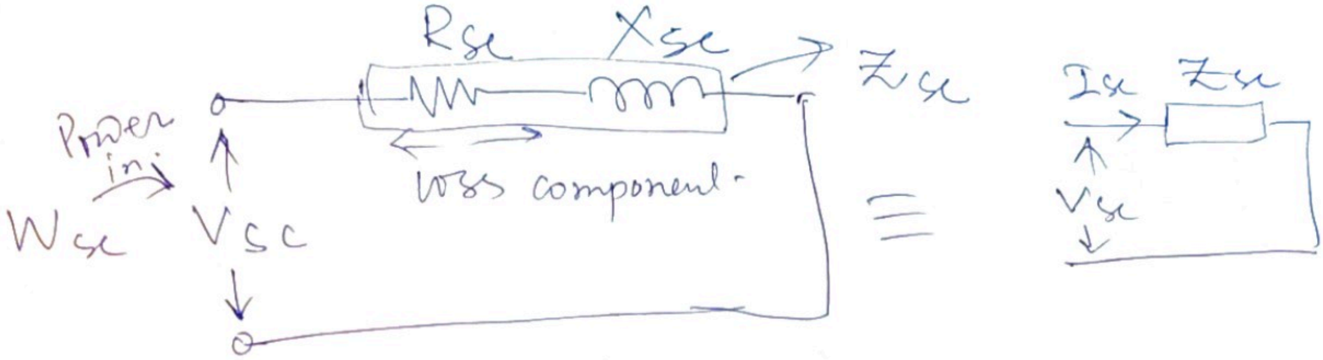
$I_\mu = I_0 \sin\phi_0$

$$R_0 = \frac{V_0}{I_W} \quad \boxed{\because V_0 = I_W \cdot R_0}$$

$$X_0 = \frac{V_0}{I_\mu} \quad \boxed{\because V_0 = I_\mu X_0}$$

When X_0 and R_0 are know OCT Eq. Ck is know

SCT - Eq. Ckt



V_{sc}
I_{sc}
W_{sc}
V_2

$$W_{sc} = I_{sc}^2 R_{sc}$$

Total impedance = Z_c, say

$$Z_{sc} = R_{sc} + jX_{sc} \qquad \boxed{Z_{sc} = \frac{V_{sc}}{I_{sc}}}$$

$$Z_{sc}^2 = R_{sc}^2 + X_{sc}^2$$

$$X_{sc} = \sqrt{Z_{sc}^2 - R_{sc}^2}$$

R_{sc} and X_{sc} are obtained
SCT E.C. is known.