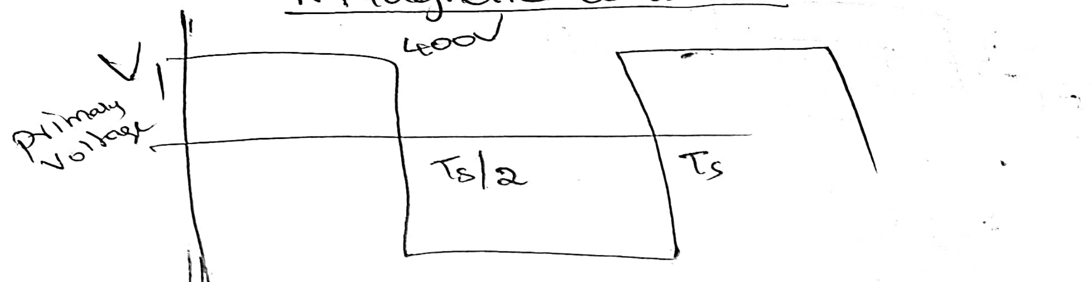
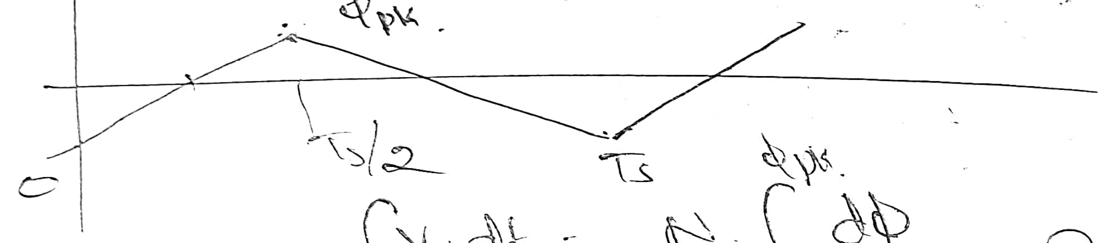
1. Magnetic constraint



$V_1 = \frac{d\lambda}{dt}$ $\quad \lambda = Li = N\phi$ $\quad V_1 = N$



$$\int V_1 \, dt = N \int_{-\phi_{pk}}^{\phi_{pk}} d\phi$$

$$V_1 \frac{T_s}{2} = N \left[2\phi_{pk} \right]$$

$$\phi_{pk} = \frac{V_1 T_s}{4N}$$

$$\boxed{B_{pk} = \frac{V_1}{4 N f_s A_c}}$$

λ = flux linkage

B_m = maximum flux density

$B_m = \phi_{pk} / A_c$

2) Electrical constraint

$$J = i/a_c$$

$$J \geq i/a_c$$

~~$i \leq J_1 a_{c1}$~~

$$i_1 \geq J a_{c1}$$

$$J_1 \geq \frac{i_{1(rms)}}{a_{c1}}$$

$$J_2 \geq \frac{i_{2(rms)}}{a_{c2}}$$

3) Mechanical constraint

$$N_1 a_{c1} + N_2 a_{c2} \leq K_w A_w$$

$$\boxed{N_1 a_{c1} + N_2 a_{c2} \leq K_w A_w}$$

Total Energy

$$V_1 I_1 + V_2 I_2 \Rightarrow 4 N_1 f_s B A_c + 4 N_2 f_s B A_c$$

$$= 4 f_s B A_c \left[N_1 \frac{J_1}{a_{c1}} + N_2 \frac{J_2}{a_{c2}} \right]$$

$$\Rightarrow 4 f_s B A_c J \left[N_1 a_{c1} + N_2 a_{c2} \right]$$

$$\Rightarrow 4 f_s B A_c J \left[K_w A_w \right]$$

$$2 VA \Rightarrow 4 f_s B A_c J A_w K_w$$

Area product

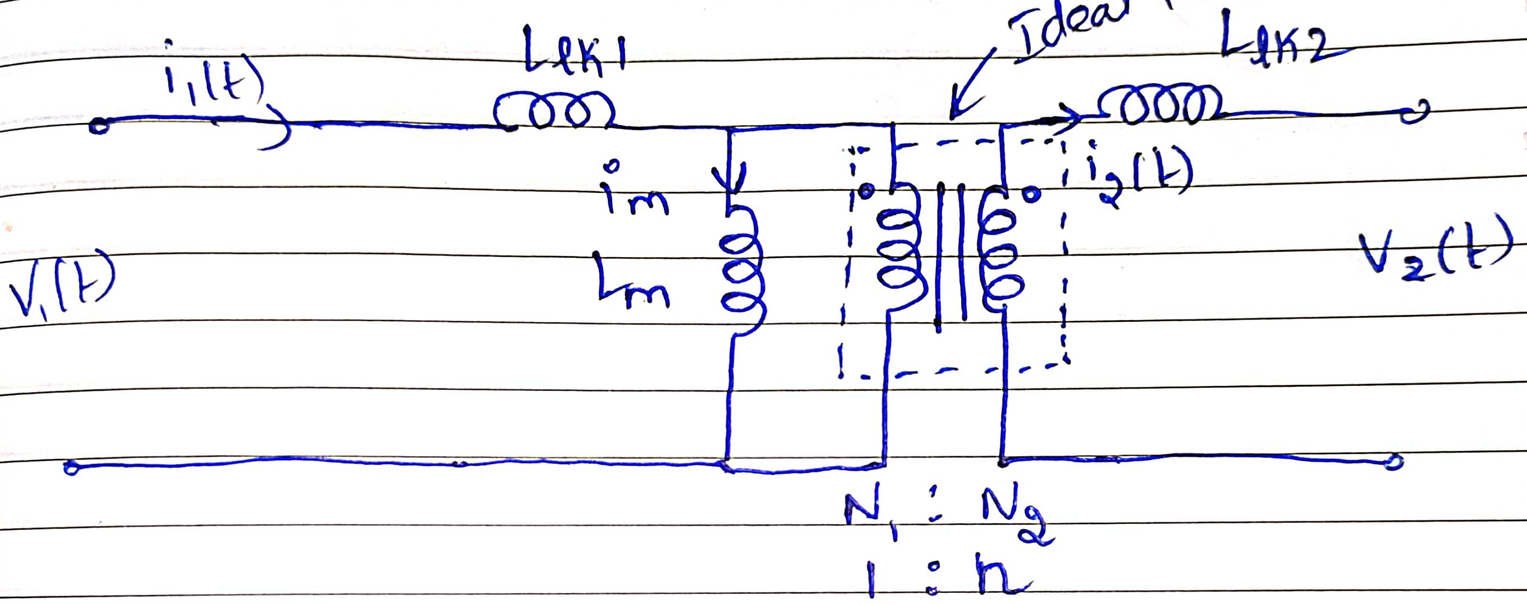
$$A_c A_w = \frac{VA}{2 f_s B_m J K_w}.$$

$$N_1 = \frac{V_1}{4 f_s B A_c}$$

$$N_2 = \frac{V_2}{4 f_s B A_c}$$

$a_{c1} = \frac{I_1}{J}$	$a_{c2} = \frac{I_2}{J}$
$a_{c1} = \frac{i_1}{J}$	$a_{c2} = \frac{i_2}{J}$

Physical Transformer model



L_m - magnetizing inductance

L_{lk1} - primary side leakage inductance

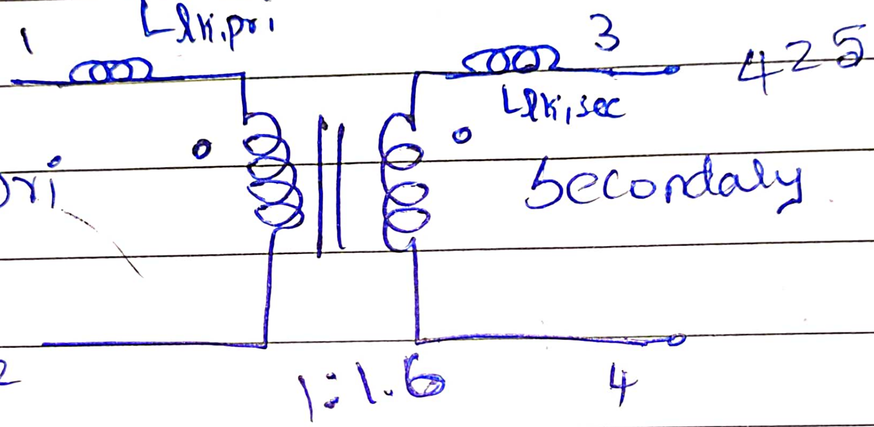
L_{lk2} - secondary side leakage inductance

N_1 - No. of primary Turns

N_2 - No. of secondary Turns.

V2.0

3.5 KW Transformer V2.0



Primary.

$L_m = 3521\ \mu H.$

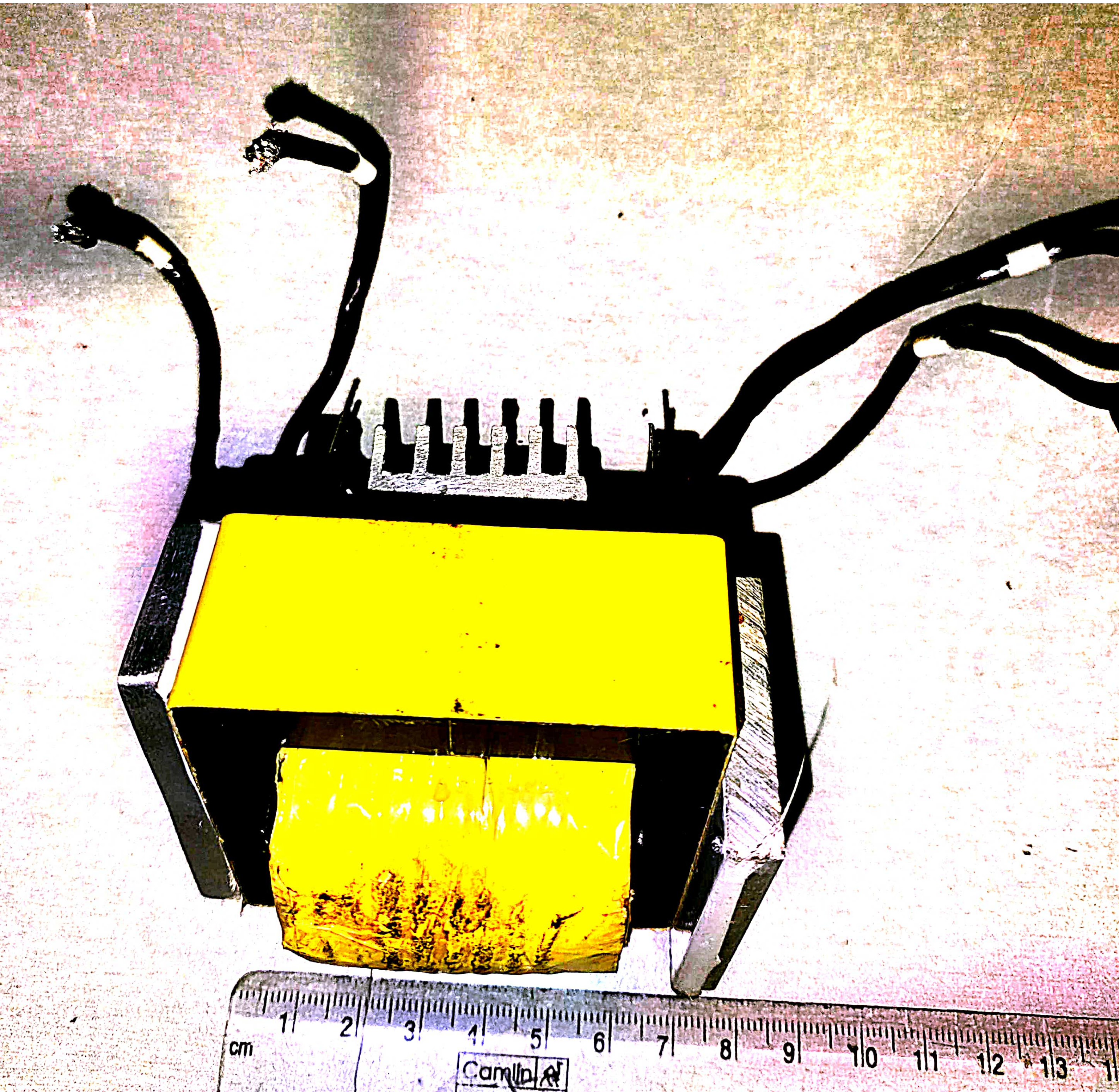
$L_{lk,pri} = 7.234\ \mu H$

Secondary:

$L_m = 771\ \mu H$

$L_{lk,sec} = 15.612\ \mu H$


cm
Camlin
@ 10KHZ, 1V
Ls : 352 mH


cm
Camlin
Exam