100 W – Flyback transformer:– 12 V, 8.3 A

$V_o = 12V$ out

$V_{in(min)} = 36V$

$V_{in(max)} = 72V$

$P_o = 100W$

$V_o' = 12 + 1 = 13V$ → with drop ✓

$\eta = 90 - 92.1$

Turns ratio (n):–

$$n = \frac{V_{in(min)}}{V_{in}'} \times \frac{D}{1-D}$$

$$= \frac{36}{13} \times \frac{0.5}{1-0.5}$$

$n = 2.76 \approx 3$

$\boxed{n = 3}$ ✓

turns ratio → 3:1

$$D_{(max)} = \frac{V_{in}' \times n}{V_{in(min)} + V_{in}' \times n}$$

$$= \frac{13 \times 3}{36 + (13 \times 3)}$$

$D_{max} = 0.52$ ✓

$$D_{(min)} = \frac{V_{in}' \times n}{V_{in(max)} + (V_{in}' \times n)}$$

$$= \frac{13 \times 3}{72 + (13 \times 3)}$$

$\boxed{D_{min} = 0.351}$ ✓

$P_o = V_o I_o$

$100 = 12 \times I_o$

$\boxed{I_o = 8.33\ A}$

$$P_{in} = \frac{P_o}{\eta} = \frac{100}{0.92}$$

$\boxed{P_{in} = 108.69W}$

$$I_{in} = \frac{108.69}{36}$$

$\boxed{I_{in} = 3.019\ A}$ ✓

$I_{sc\,peak} = 8.33 \times (1.2)$

$\boxed{I_{sc\,peak} = 10\ A}$ ✓

$$\Delta I_{max} = I_{sc\,peak} \times \frac{2}{D_{min}}$$

$$= 10 \times \frac{2}{0.351}$$

$\Delta I_{max} = 56.98\ A$ ✓

$\boxed{\Delta I_{max} = 56.98\ A}$

$$\Delta B_{max} = 0.22 \times \frac{n}{2}$$ → 2.76

$\boxed{\Delta B_{max} = 0.30}$ ⇒ 0.2 + 0.3 → avg

Inductance 'L' :-

$$L = \frac{V_o' \Delta t}{\Delta i}$$

$$= \frac{V_o' \times T \times D_{cmin}}{\Delta I_{max}}$$

$$= \frac{15 \times 0.351}{100 \times 10^{-3} \times 56.98}$$

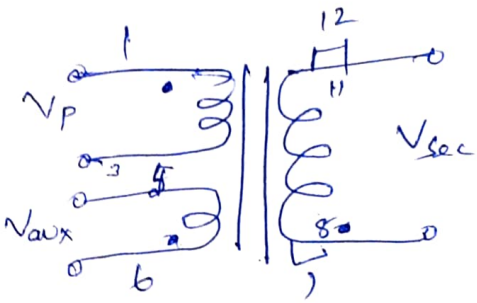
$$L = 0.80\,\mu H$$

$I_{in} = 3.019$ A (P)

$I_{out} = 8.33$ A

$I_{AUX} = 1$ A.

Calculate No. of turns on secondary.



$$N_s = \frac{L \Delta I_{max}}{\Delta B_{max} \cdot A_e} \times 10^2$$

$L \rightarrow \mu H$, $A_e = 1.2$ cm.

$\Delta B_{max} = 0.22$

$$N_s = \frac{0.80 \times 56.98}{0.22 \cdot 1.28} \times 10^{-2}$$

$\rightarrow 0.3$

$\rightarrow 1.18$

$N_s = 1.61$

$N_s \simeq 2$ turns

$N_p = n \times N_s$

$= 3 \times 2$

$N_p = 6$ turns

100W flyback transformer, 24V, 4A.

$V_o = 24V$ out.

$V_{in(min)} = 48V$

$V_{in(min)} = 36V$

$V_{in(max)} = 72V$ → with drop.

$V_{in}' = 24 + 1 = 25V$

$P_o = 100W$

$\eta = 90 - 92\%$

turn ratio, (n)

$$n = \frac{V_{in(min)}}{V_{in(max)} + (V_{in}' \times n)}$$

$$n = \frac{V_{in(min)}}{V_{in}'} \times \frac{D}{1-D}$$

$$= \frac{36}{25} \times \frac{0.5}{1-0.5}$$

$n = 1.44 \cong 2$

$\boxed{n = 2}$ too ✓

turn ratio ⇒ 2:1

$$D_{max} = \frac{V_{in}' \times n}{V_{in(min)} + V_{in}' \times n}$$

$$= \frac{25 \times 2}{36 + [25 \times 2]}$$

$\boxed{D_{max} = 0.58}$

$$D_{min} = \frac{25 \times 2}{72 + [25 \times 2]}$$

$\boxed{D_{min} = 0.40}$

$P_o = V_o I_o$

$100 = 24 \times I_o$

$\boxed{I_o = 4.16A}$

$$P_{in} = \frac{P_o}{\eta} = \frac{100}{0.92}$$

$\boxed{P_{in} = 108.69W}$

$$I_{in} = \frac{108.69}{36}$$

$\boxed{I_{in} = 3.019A}$ → $\times 1.2 = 3.69 \cong 4$ (or) 5

$I_{sc\,peak} = 5A$

$$\Delta I_{max} = I_{sc\,peak} \times \frac{2}{D_{min}}$$

$$= \frac{5 \times 2}{0.40}$$

$\boxed{\Delta I_{max} = 25A}$ ✓

$$\Delta B_{max} = 0.22 \times \frac{1.44}{2}$$

$\boxed{\Delta B_{max} = 0.15}$ ↓

⇒ 0.2 → 0.3

0.22 avg

Inductance 'L':-

$$L = \frac{V_o' \Delta t}{\Delta i}$$

$$= \frac{V_o' \times T \times D_{min}}{\Delta I_{max}}$$

$$= \frac{25 \times 0.40}{100 \times 10^{3} \times 25}$$

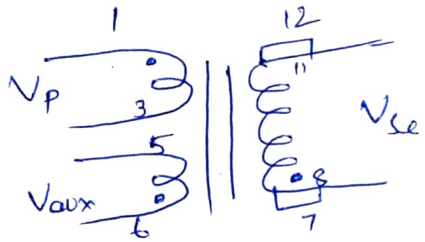
$$L = 4\,\mu H$$

$I_{in(p)} = 3.019$

$I_{out} = 4.16\,A$

$I_{aux} = 1\,A$

Calculate the No. of turn on secondary side.



$$N_s = \frac{L \Delta I_{max}}{\Delta B_{max} \cdot A_e} \times 10^{-2}$$

$$= \frac{4 \times 25}{0.22 \times 1.28} \times 10^{-2}$$

$N_s = 3.55 \simeq 4$

$N_s = 4$ turns

$N_p = n \times N_s$

$= 2 \times 4$

$N_p = 8$ turns

100W, 12V dual out Flyback transformer.
12V 7A, 12V 1A.

$V_o = 12V$

$V_{in(min)} = 36V$

$V_{in(max)} = 72V$

$V_{out1} = 12V$

$V_{out2} = 12V$

$V_{aux} = 12V$

$I_{out1} = 7A$

$I_{out2} = 1A$

$\eta = 0.92$

V_o' with drop $= 12 + 1$
$= 13V$

duty $= 0.5 \Rightarrow D$

$f_{sw} = 100\ kHz$

turns ratio, (n)

$$n = \frac{V_{in(min)}}{V_{in}'} \times \frac{D}{1-D}$$

$$= \frac{36}{13} \times \frac{0.5}{1-0.5}$$

$n = 2.76 \simeq 3$

$\boxed{n = 3}$

turns ratio $\rightarrow n_1 : n_2 \rightarrow 3:1$

$$D_{max} = \frac{V_{in}' \times n}{V_{in(min)} + [V_{in}' \times n]}$$

$$= \frac{13 \times 3}{36 + [13 \times 3]}$$

$\boxed{D_{max} = 0.52}$

$P_{o1} = V_{o1} \times I_{o1}$

$P_{o1} = 12 \times 7 = 84W$

$P_{o2} = 12 \times 1 = 12W$

$P_{aux} = 12 \times 1 = 12W$

$P_o = 84 + 12 + 12 = 108W$

$\boxed{P_o = 108W}$ ✓

$$P_{in} = \frac{P_o}{\eta} = \frac{108}{0.92}$$

$\boxed{P_{in} = 117.39W}$ ✓

$$I_{in} = \frac{P_{in}}{V_{in(min)}} = \frac{117.39}{36}$$

$\boxed{I_{in} = 3.260\ A}$ ✓

$I_{sc\,peak} = (7 + (1)) \times 1.2$

$\boxed{I_{sc\,peak} = 9.6\ A}$

$$D_{min} = \frac{N_{in}' \times n}{V_{in(max)} + [V_{in}' \times n]}$$

$$= \frac{13 \times 3}{72 + [13 \times 3]}$$

$\boxed{D_{min} = 0.35}$

$$\Delta I_{max} = I_{sc\,peak} \times \frac{2}{D_{min}}$$

$$= \frac{9.6 \times 2}{0.35}$$

$\boxed{\Delta I_{max} = 51.85\ A}$

$\Delta B_{max} = 0.22$

From Thump.

$$\Delta B_{max} = 0.22 \times \frac{n}{2}$$

$$= 0.22 \times \frac{2.76}{2}$$

$$\boxed{\Delta B_{max} = 0.30}$$

anyway it is $0.2 - 0.3$ ↓ 0.22 ≡.

Inductance 'L' :-

$$L = V_o' \frac{\Delta t}{\Delta i}$$

$$= V_o' \times T \times \frac{D_{min}}{\Delta I_{max}}$$

$$= \frac{13 \times 0.35}{100 \times 10^{3} \times 54.85} \times 10^{-2}$$

$$= 0.82 \times 10^{-6}$$

$$\boxed{L = 0.82 \mu H}$$ → 4.5

Calculate No. of turns on Secondary side, $L = 1 \mu H$

$$N_s = \frac{L \Delta I_{max}}{\Delta B_{max} \cdot A_e} \times 10^{-2}$$

$$= \frac{0.82 \times 54.85}{0.22 \times 1.28} \times 10^{-2}$$

$N_s = 1.59 \simeq 2$ turns

$N_p = n \times N_s = 3 \times 2 = 6$ turns

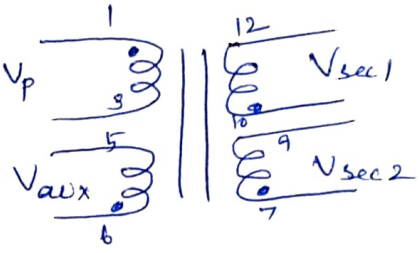
$N_{aux} = 2$ turns.

$I_{in(p)} = 3.260$ A

$I_{out} = 7$ A

$I_{out2} = 1$ A

$I_{aux} = 1$ A.



if $\Delta B_{max} = 0.3$

$$N_s = \frac{0.82 \times 54.85}{0.3 \times 1.28} \times 10^{-2}$$

$N_s = 1.17 \simeq 2$ turns

100 W, 24 V dual out, Flyback transformer.

24V 3A, 24V 1A.

$V_o = 24V$

$V_{in(min)} = 36V$

$V_{in(max)} = 72V$

$V_{in(nom)} = 48V$

$V_{out1} = 24V$

$V_{out2} = 24V$

$V_{aux} = 12V$

$I_{out1} = 3A$

$I_{out2} = 1A$

$I_{aux} = 1A$

$\eta = 0.92$

V_o' with drop $= 24 + 1$
$= 25V$

$D = 0.5 \rightarrow$ duty.

$f_{sw} = 100 \times 10^3$

turns ratio 'n':-

$$n = \frac{V_{in(min)}}{V_{in}'} \times \frac{D}{1-D}$$

$$= \frac{36}{25} \times \frac{0.5}{1-0.5}$$

$n = 1.44 \simeq 2$

$n = 2$ ~~duty~~ turns ratio
↳ n:1 → 2:1

$$D_{max} = \frac{V_{in}' \times n}{V_{in(min)} + [V_{in} \times n]}$$

$$= \frac{25 \times 2}{36 + [25 \times 2]}$$

$D_{max} = 0.56$

$P_{o1} = V_{o1} \times I_{o1}$

$P_{o1} = 24 \times 3 = 72 W$

$P_{o2} = V_{o2} \times I_{o2}$

$P_{o2} = 24 \times 1 = 24 W$

$P_{aux} = 12 \times 1 = 12 W.$

$P_o = 72 + 24 + 12$

$P_o = 108 W$

$$P_{in} = \frac{P_o}{\eta} = \frac{108}{0.92}$$

$P_{in} = 117.39 W$

$$I_{in} = \frac{P_{in}}{V_{in(min)}} = \frac{117.39}{36}$$

$I_{in} = 3.260 A$

$I_{sc\,peak} = (3 + 1 + 1) \times 1.2$

$I_{sc\,peak} = 5 A$

$$D_{min} = \frac{V_{in}' \times n}{V_{in(max)} + [V_{in}' \times n]}$$

$$= \frac{25 \times 2}{72 + [25 \times 2]}$$

$D_{min} = 0.40$

$$\Delta I_{max} = I_{sc\,peak} \times \frac{2}{D_{min}}$$

$$= 5 \times \frac{2}{0.40}$$

$\Delta I_{max} = 25 A$

$\Delta B_{(max)}$ → it will be 0.22

$\Delta B_{max} = 0.22 \times \frac{h}{2}$

$= 0.22 \times \frac{1.4}{2}$

$\Delta B_{max} = 0.15$ → 0.22

Inductance 'L' :-

$L = V_o' \frac{\Delta t}{\Delta i}$

$= \frac{V_o' \times T \times D_{min}}{\Delta I_{max}}$

$= \frac{25 \times 0.40}{100 \times 10^{3} \times 25}$

$L = 4\mu H$ → 1.7°

Calculate No of turns on Secondary side,

$N_s = \frac{L \Delta I_{max}}{\Delta B_{max} \cdot A_e} \times 10^{-2}$

$L = 7\mu H$, $A_e = 5$ cm.

$= \frac{4 \times 25}{0.15 \times 1.28} \times 10^{-2}$

$N_s = 5.2$

$N_s = 5$ turns

$N_p = n \times N_s = 2 \times 5$

$N_p = 10$ turns

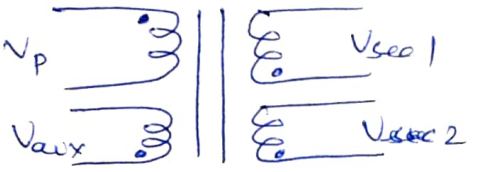
$N_{aux} = 2$ turns

$I_{in(p)} = 3.260$ A

$I_{out1} = 3$ A

$I_{out2} = 1$ A

$I_{aux} = 1$ A.



if $\Delta B_{max} = 0.22$

$N_s = \frac{4 \times 25}{0.22 \times 1.28} \times 10^{-2}$

$= 3.55 \simeq 4$

$N_s = 4$ turns

$N_p = 2 \times 4 = 8$

$N_p = 8$ turns

$N_{aux} = 2$ turns