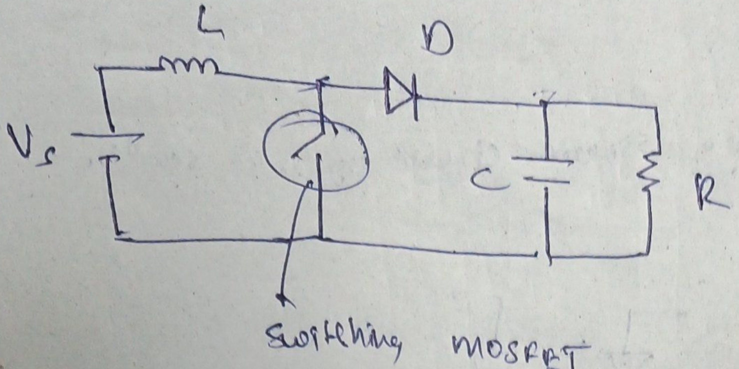
* Boost converter:



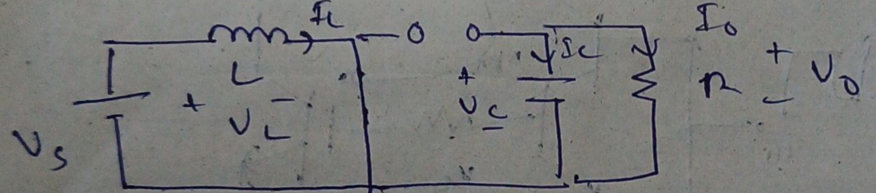
Circuit

$0 < t < T_{ON}$ → SW → ON, D → OFF

$T_{ON} < t < T$ CH → OFF D → ON

① When switch ON $t \in (0, T_{ON}]$

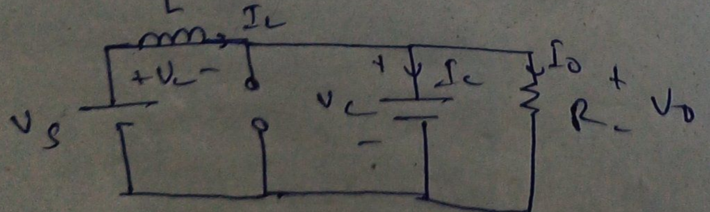
Diode off state



$V_L = V_s$

$I_C = -I_0$

② When switch is off $T_{ON} < t < T_{OFF}$



$I_L = I_C + I_0$ $I_C = I_L - I_0$ ①

$V_L = V_s - V_0$ - ②

Indipedia

Voltage across capacitor

Average V_0 : Volt sec Balance

$$\int V_L \, dt = 0$$

$$(V_s)(T_{on}) + (V_s - V_0)(T - T_{on}) = 0$$

$$(V_s)(DT) + (V_s - V_0)(1-D)T = 0$$

$$\left(V_0 = \frac{V_s}{1-D} \right)$$ $\underline{\underline{V_0 > V_s}}$ Step up chopper

Avg I_L

$$\int i_c \, dt = 0$$

$$-I_0 (DT) + (I_L - I_0)(1-D)T = 0$$

$$I_L = \frac{I_0}{(1-D)}$$

$$I_0 = \frac{V_0}{R}$$

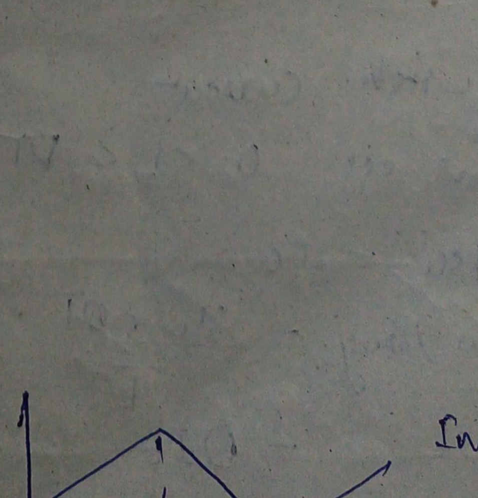
$$I_0 = \frac{V_0}{R} \quad [R \text{ \& } RL)$$

$$I_0 = \left(\frac{V_0 - E}{R} \right) \quad (\text{RE and RLE})$$

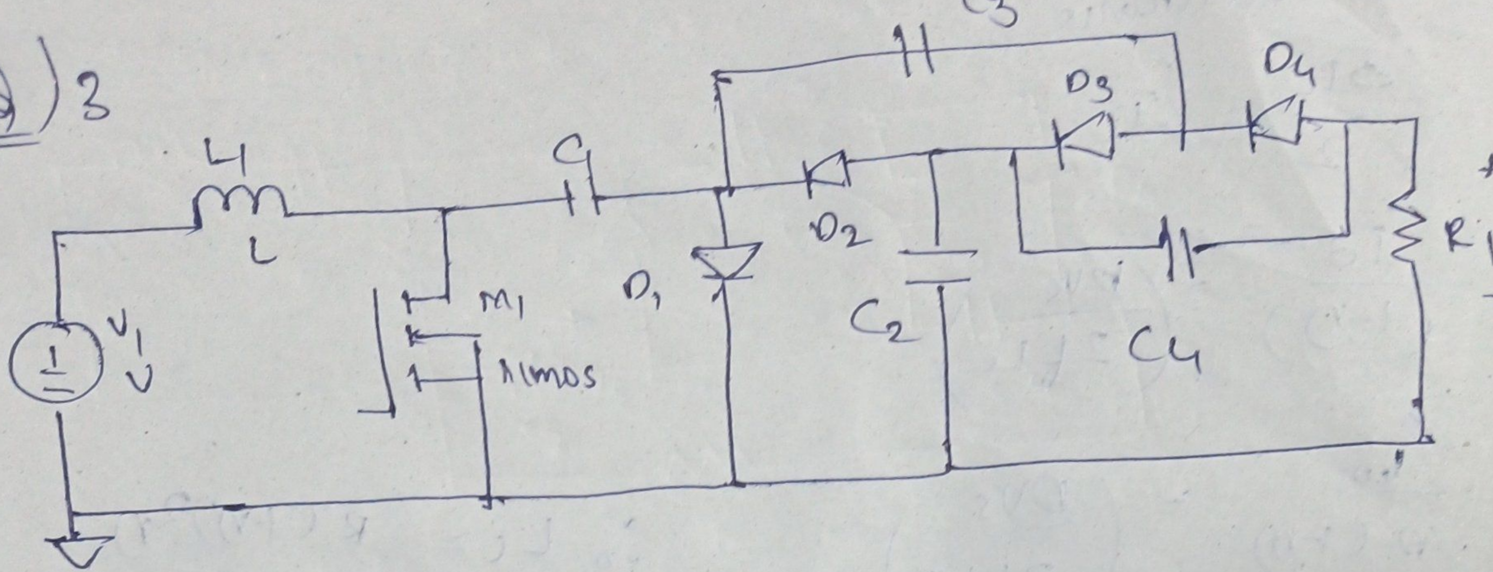
Ripple in Inductor current

$V_L = V_S \quad 0 < t < DT$

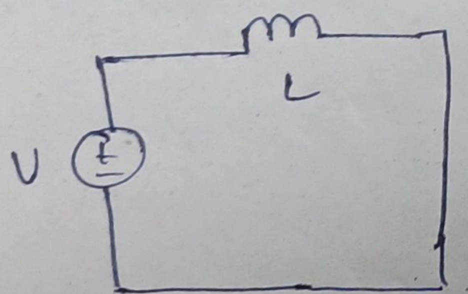
L (I_{max} to I_{min})



(Q) 3

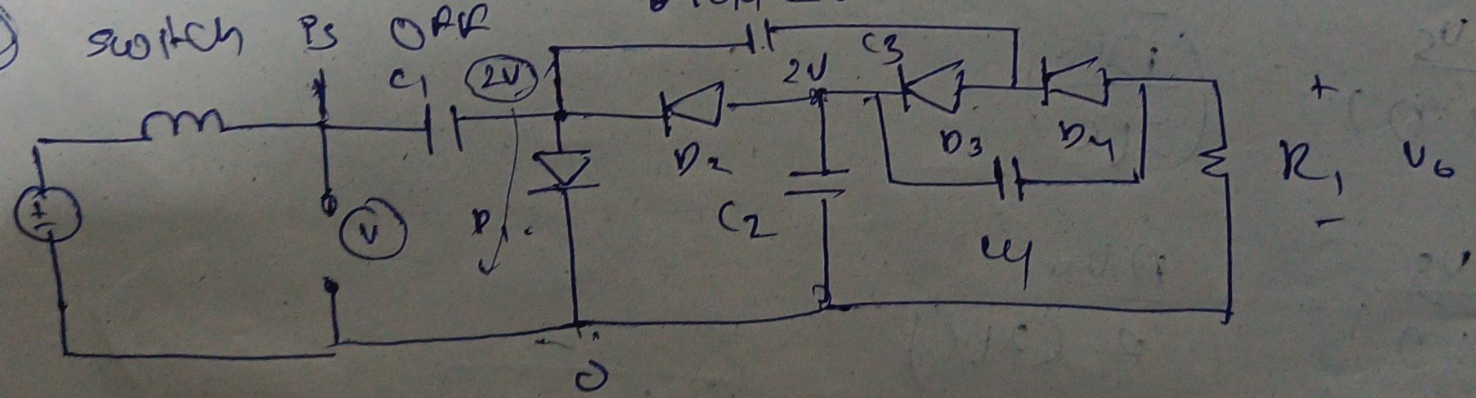


① switch is ON $0 < t < t_{on}$

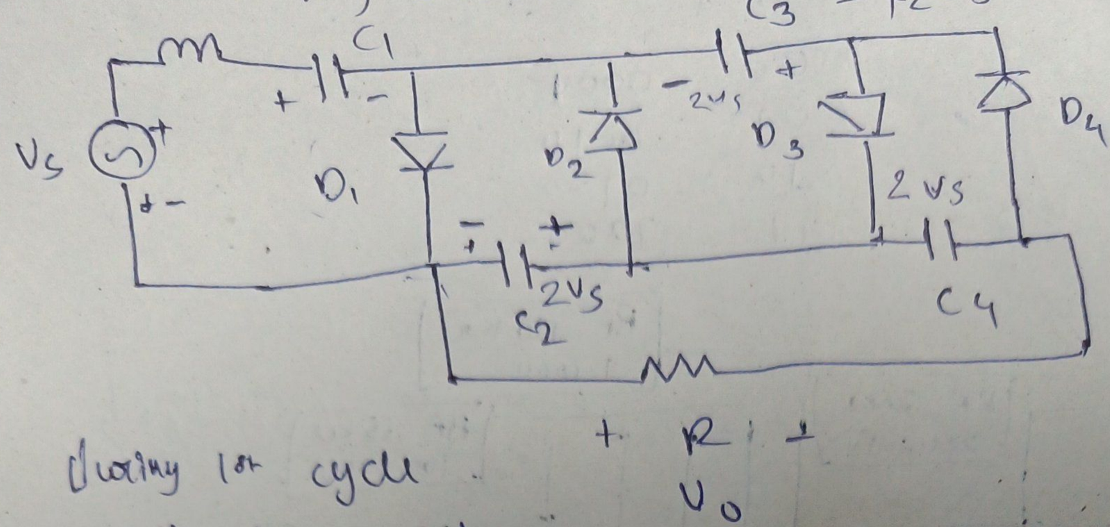


$$I_L = \frac{V}{X_L} = \left(\frac{V}{\omega L}\right)$$

② switch is OFF $t_{on} < t < t_{off}$



Simplifying circuit (when switch is OFF)



during 1st cycle

The $V_{C1} = 2V_s$

$V_{D1} = (-V_s)$

-ve cycle

~~$-V_s + (2V_s) \dots$~~ $-V_s + 2V_s + V_{C2} = 0$

$V_{C2} = (-V_s)$

$-V_s + 2V_s + V_{C3} + \cancel{V_s} = 0$

$V_{C3} = -2V_s$

∴ At the time steady state

$V_{C1} = -V_s$

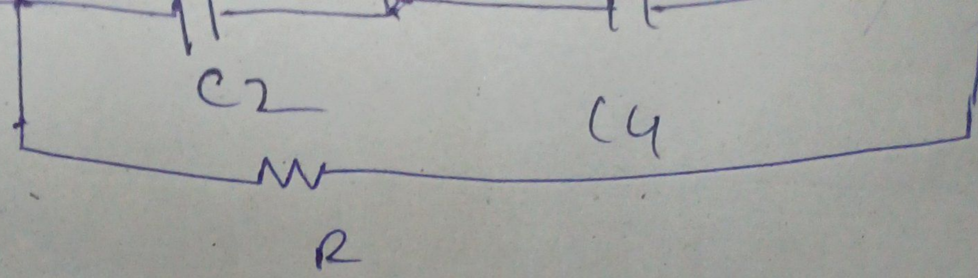
$V_{C2} = -2V_s$

$V_{C3} = -2V_s$

$V_{C4} = -2V_s$

∴ $V_o = -(4V_s)$

~~Boosts~~ ∴ ~~V_{oc}~~ =



For the Boost converter

$$V_o = \frac{V_s}{(1-D)}$$

$$V_s = (4V_s)$$

$$\therefore V_o = -\frac{4V_s}{(1-D)}$$

From 1st Question we get $K = 5$

$$\therefore \frac{V_o}{V_s} = \frac{-(1-K)}{(1-D)}$$

Hence proved