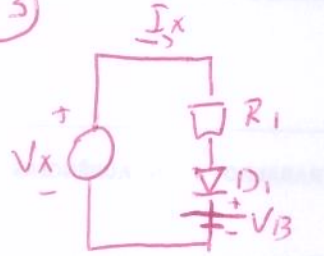
Lista de Exercícios (3,4,7,8,20,32,34,35)

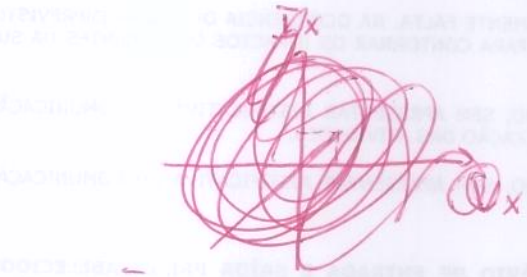
RAZAVI - CAP3 pg 99

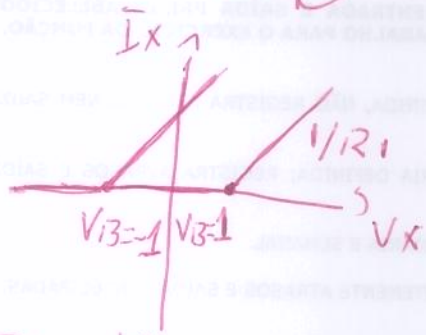
(3.3)



$$\begin{cases} D_1: F \Rightarrow V_x > V_B \Rightarrow I_x = \dfrac{V_x - V_B}{R_1} \\ D_1: A \Rightarrow V_x \leq V_B \Rightarrow I_x = 0 \end{cases}$$

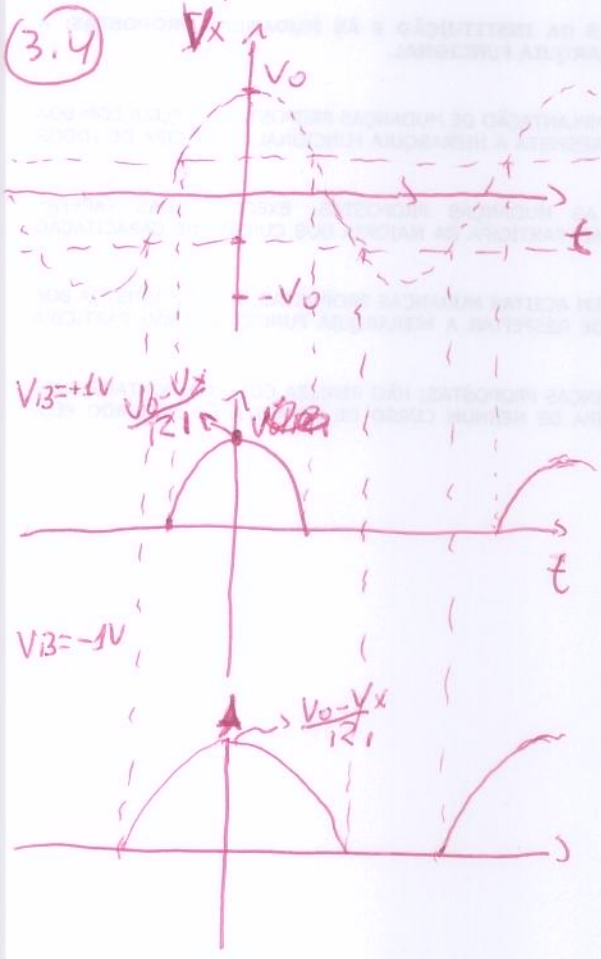
$$\begin{cases} V_B = 1 \Rightarrow I_x = \dfrac{V_x - 1}{R_1}, V_x > V_B \\ V_B = -1 \Rightarrow I_x = \dfrac{V_x + 1}{R_1}, V_x < V_B \end{cases}$$



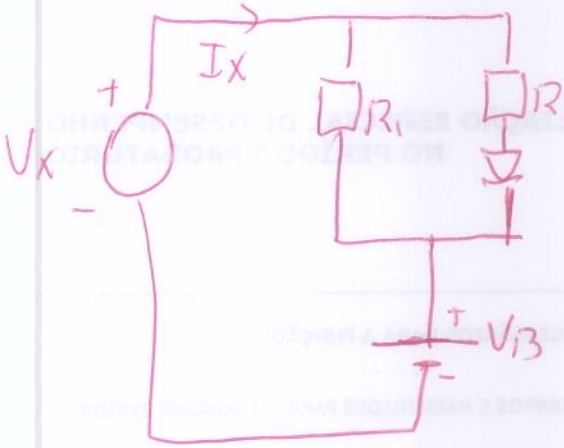


(3.4)

$V_x = V_o \cos \omega t$



3.7

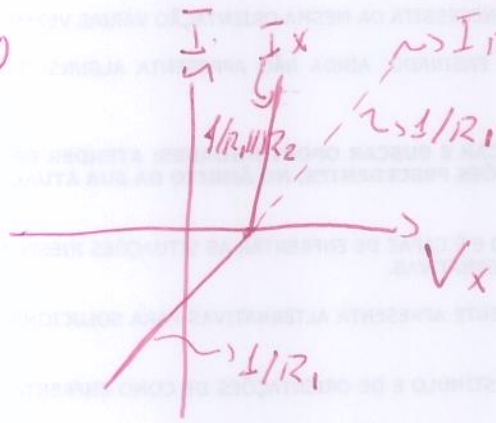


$V_X > V_{13} \Rightarrow D_1$: F $\Rightarrow I_X = (V_X - V_{13})/R_1 /\!/ R_2$

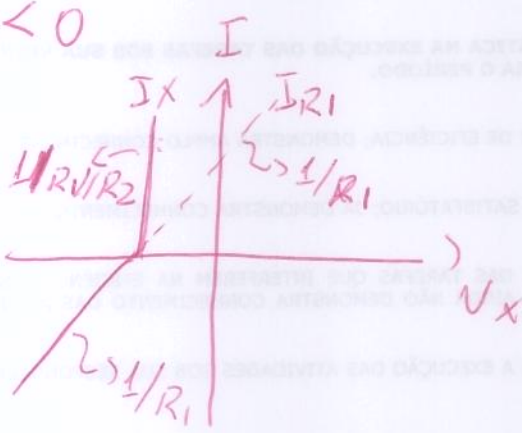
$I_{R_1} = (V_X - V_{13})/R_1$

$V_X \leq V_{13} \Rightarrow D_1$ A $\Rightarrow I_X = I_1 = (V_X - V_{13})/R_1$

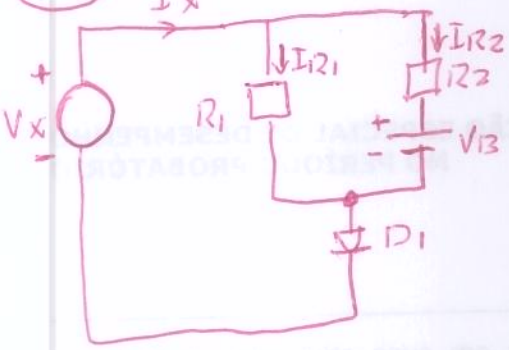
$V_{13} > 0$



$V_{13} < 0$



3.8



* D1 Fechado

- Lei dos nós

$$I_x = I_{R1} + I_{R2} \quad (1)$$

- $I_{R1} = \frac{V_x}{R_1}$ (2)
- $I_{R2} = \frac{V_x - V_B}{R_2}$ (3)

(3) e (2) em (1)

$$I_x = \frac{V_x}{R_1} + \frac{V_x - V_B}{R_2} \quad (4) \Rightarrow I_x = \frac{R_2 V_x + R_1 V_x - R_1 V_B}{R_1 . R_2}$$

$$\Rightarrow I_x = \frac{V_x (R_2 + R_1) - R_1 V_B}{R_1 R_2}$$

$R_2 + R_1 \rightarrow 1/R_1 // R_2$

p/ D1:F $\Rightarrow I_x > 0 \Rightarrow \frac{V_x (R_2 + R_1) - R_1 V_B}{R_1 R_2} > 0$

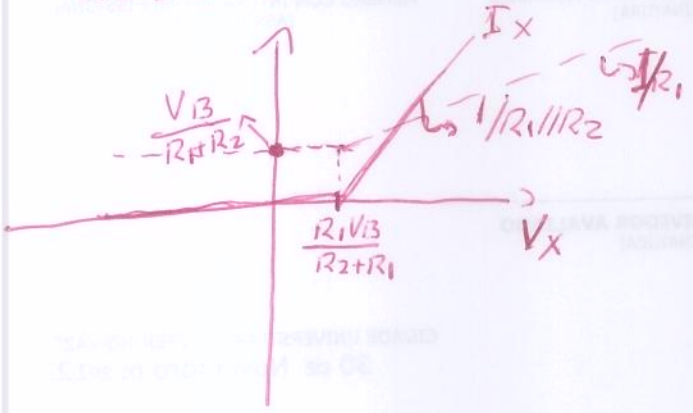
$$\Rightarrow V_x > \frac{R_1 V_B}{R_2 + R_1} \quad (5)$$

* D1 Aberto $\Rightarrow V_x < \frac{R_1 V_B}{R_2 + R_1}$

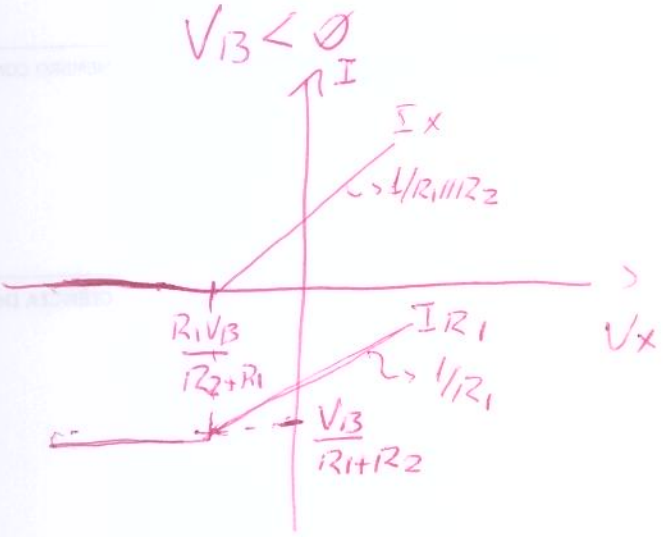
$I_x = 0$

$I_{R1} = \frac{V_B}{R_1 + R_2}$

$V_B > 0$

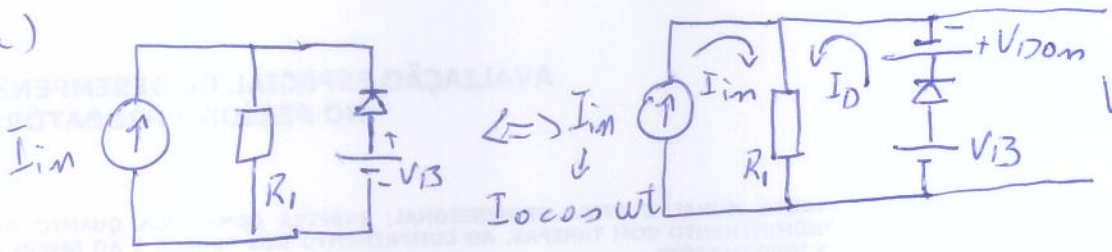


$V_B < 0$



3.20

a)



$V_{out} = V_{I3} - V_{IDon}$

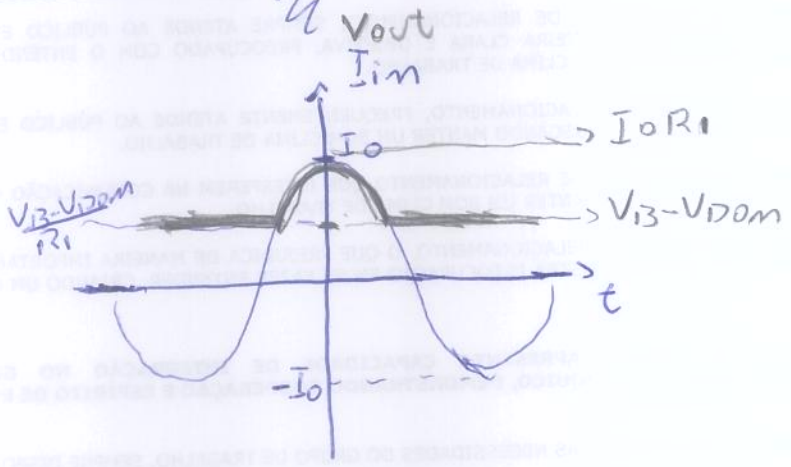
✱ D_1: F

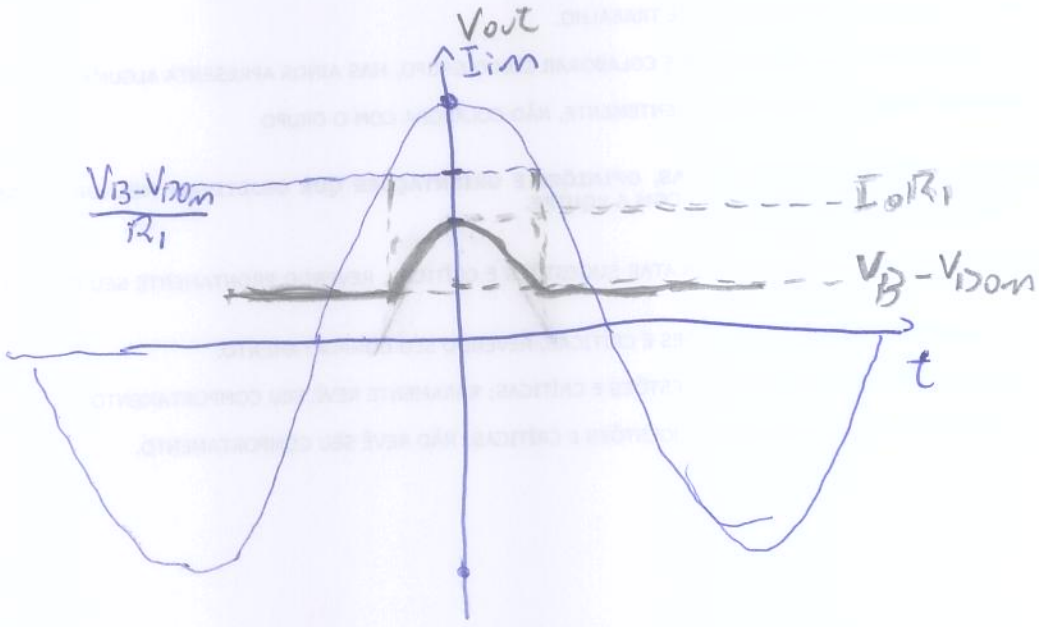
$$\begin{cases} I_{R1} = \dfrac{V_{out}}{R_1} = \dfrac{V_{I3} - V_{IDon}}{R_1} \Rightarrow I_D + I_{in} = \dfrac{V_{out}}{R_1} \Rightarrow \boxed{I_D = \dfrac{V_{I3} - V_{IDon}}{R_1} - I_{in}} \\ I_{R1} = I_D + I_{in} \end{cases}$$

- $\underbrace{I_D > 0}_{D_1: F} \Rightarrow \dfrac{V_{I3} - V_{IDon}}{R_1} - I_{in} > 0 \Rightarrow \boxed{I_{in} < \dfrac{V_{I3} - V_{IDon}}{R_1}}$

✱ D_1: A

$$\boxed{V_{out} = R_1 \cdot I_{in}}$$



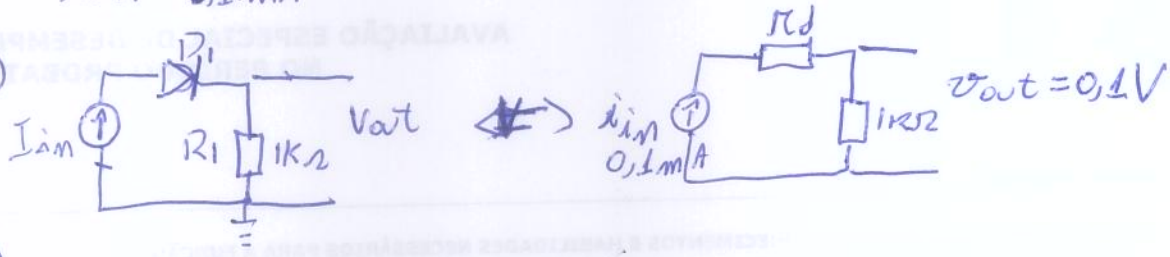


3.32 $V_{D(on)} = 800mV \quad V_T = 26mV$

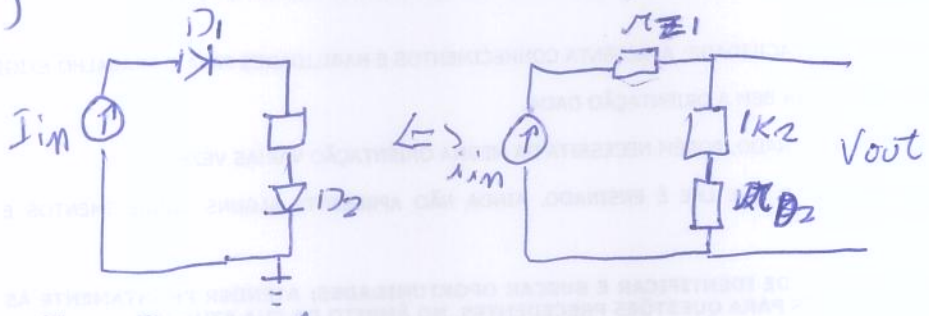
$I_{in} = 3mA$

$i_{in} = 0,1mA$

a)



b)

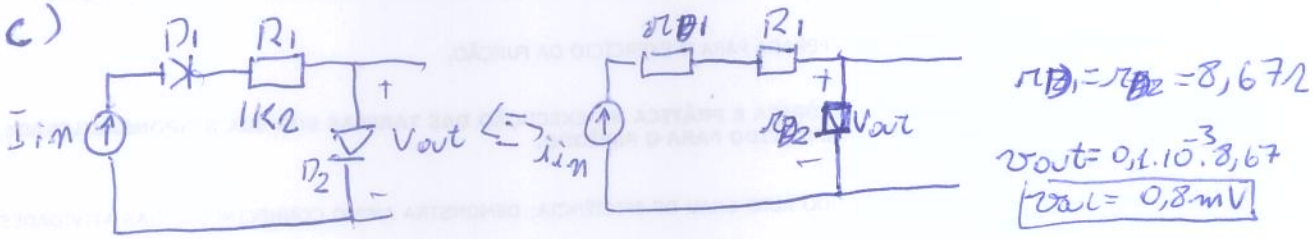


$I_{D1} = I_{D2} = 3mA$

$r_{z1} = r_{z2} = \frac{V_T}{I_{D1}} \Rightarrow r_{z1} = r_{z2} = \frac{26.10^{-3}}{3.10^{-3}} \Rightarrow \boxed{r_{D1} = r_{D2} = 8,67\Omega}$

$v_{out} = 0,1.10^{-3} \cdot (1000 + 8,67) \Rightarrow \boxed{v_{out} = 0,100867V}$

c)

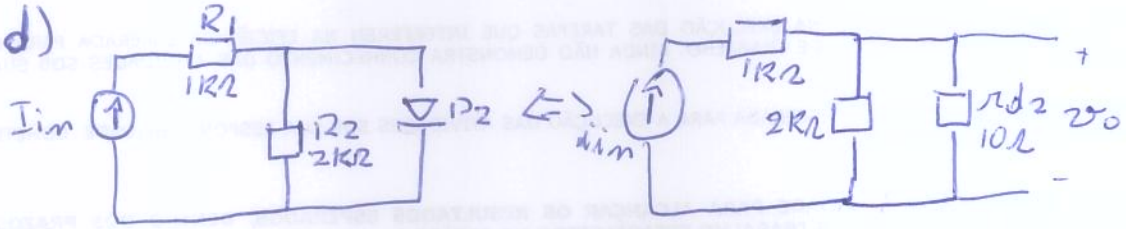


$r_{D1} = r_{D2} = 8,67\Omega$

$v_{out} = 0,1.10^{-3}.8,67$

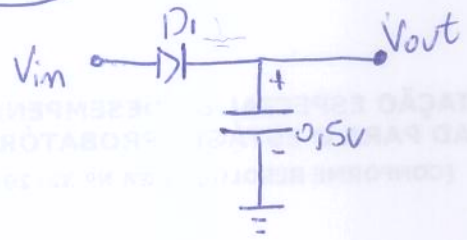
$\boxed{v_{out} = 0,8mV}$

d)

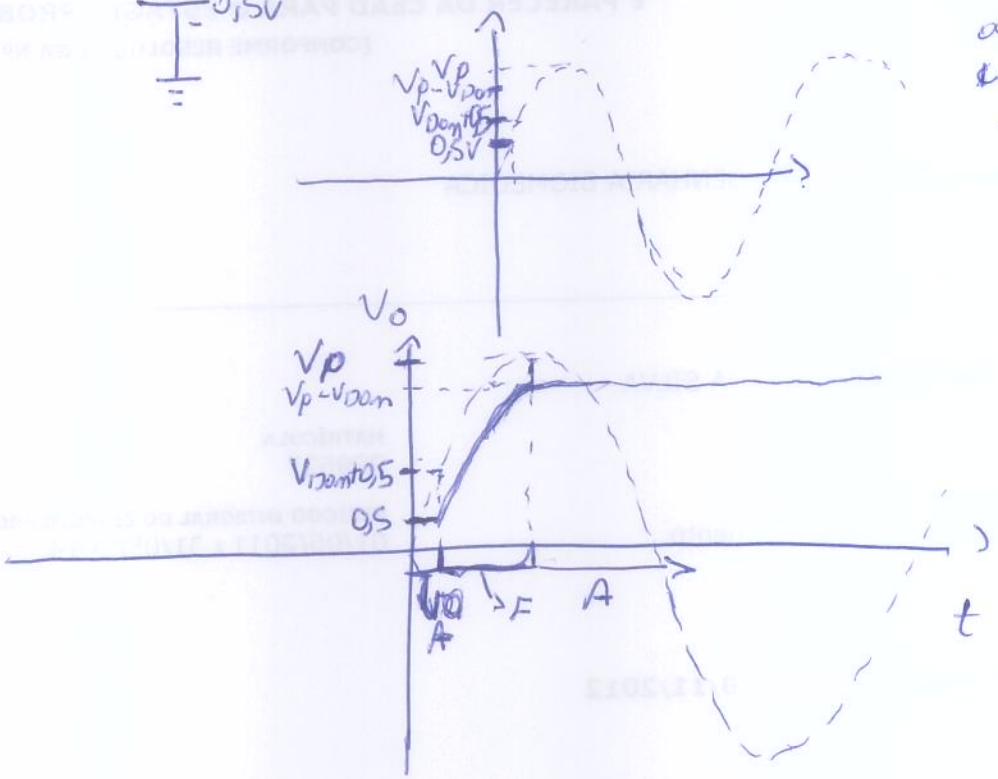


- $V_{D2} \geq 0 \Rightarrow D_2: F \Rightarrow V_{D2} = V_{on} = 0,8V$
- $I_{R2} = \frac{0,8}{2.10^{+3}} \Rightarrow I_{R2} = 0,4.10^{-3}A$
- $I_{R1} = I_{in} = 3.10^{-3}A$
- $I_{D2} = I_{in} - I_{R2} \Rightarrow \boxed{I_{D2} = 2,6.10^{-3}A}$
- $r_{d2} = \frac{26.10^{-3}}{2,6.10^{-3}} \Rightarrow r_{d2} = 10\Omega$
- $r_{d2} // 2K\Omega = \frac{2000.10}{2010} = 9,95\Omega$
- $v_o = (r_{d2} // 2K\Omega).i_{in} = 9,95.0,1.10^{-3} \Rightarrow \boxed{v_o = 0,995mV}$

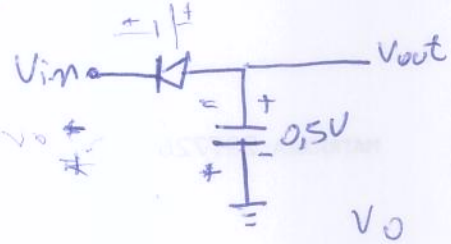
3,34



- D_1: A $\Rightarrow V_{in} < 0,5V \Rightarrow V_{out} = 0,5V$
- D_1: F $\Rightarrow \begin{cases} V_{in} > 0,5 + V_{Don} \Rightarrow V_{out} = V_i - V_{Don} \\ V_{out} < V_{in} - V_{Don} \end{cases}$ capacitor tende a descarregar com corrente reversa
- D_1: A $\Rightarrow$



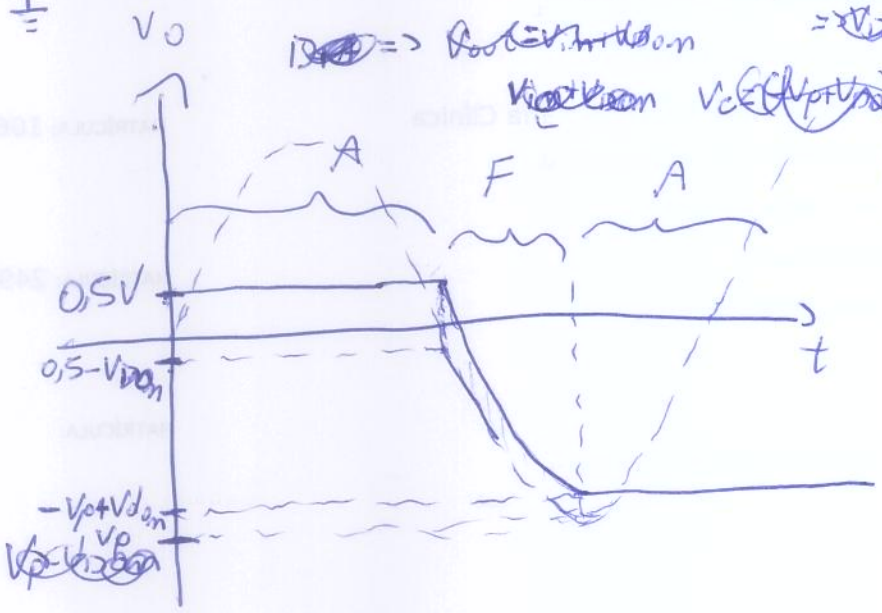
3,35



D_1: A $\Rightarrow V_{out} = 0,5V \Rightarrow V_{in} + V_{Don} \leq 0,5$

$V_{in} + V_{Don} \leq 0,5 \Rightarrow V_{in} \leq 0,5 - V_{Don}$

D_1: F $\Rightarrow V_{out} > V_{in} + V_{Don}$



D_1: A

$\Rightarrow$:

$-V_p + V_{don} < V_{in} + V_o$

V_{out}