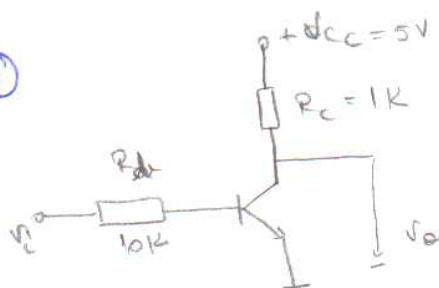
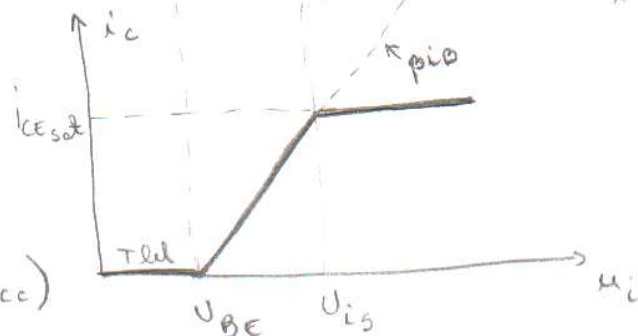
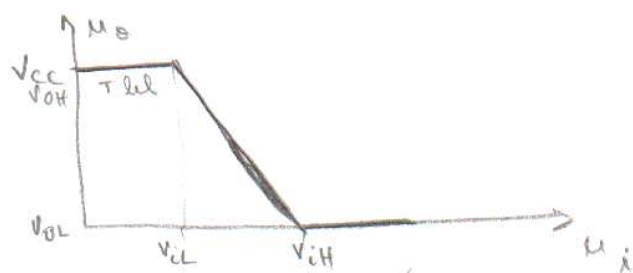


Pregătire examen

①



$$U_{BE} = 0,8V, \beta = 50$$



$$u_o = V_{CC} - i_c R_C \quad (1)$$

$$u_i < U_{BE} \Rightarrow T \text{ lăsat}$$

($i_B = i_C = 0; u_o = V_{CC}$)

$$u_i > U_{BE} \Rightarrow T \text{ deschis}$$

$$i_B = \frac{u_i - U_{BE}}{R_B}$$

$$\text{în RAN (pt. } u_o > 0)$$

$$i_C = \beta i_B \Rightarrow u_o = V_{CC} - \frac{\beta R_C}{R_B} \cdot (u_i - U_{BE}) \quad (\text{înlocuiește în rel. (1)})$$

T este în RAN pt. $U_{BE} < u_i < U_{is}$

Pt. $u_i > U_{is}$, T este saturat, $u_o = 0$, $i_C = \frac{V_{CC}}{R_C} = i_{CSAT}$

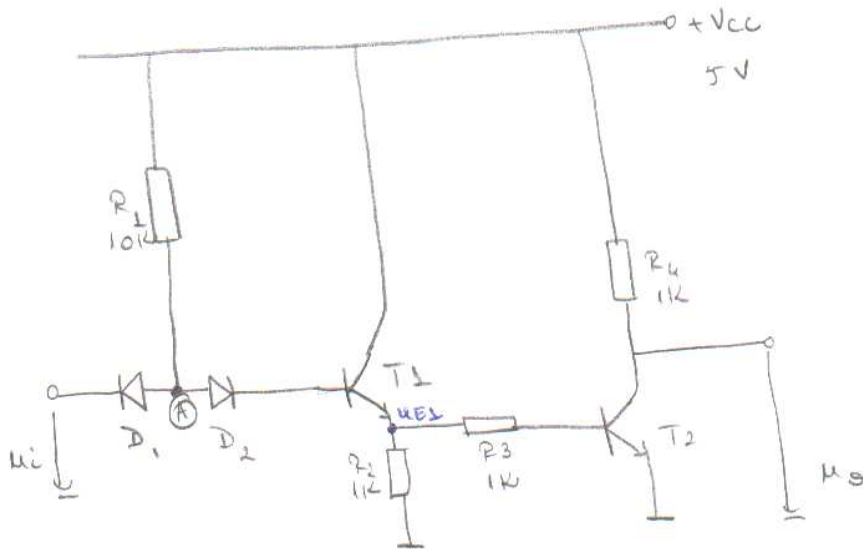
Pt. $u_i = U_{is}$, T este la saturatie incipienta

$$i_B = \frac{i_C}{\beta} = \frac{i_{CS}}{\beta} = \frac{V_{CC}}{\beta R_C} = i_{BSI}$$

$$u_o = 0 \quad (2) \quad i_B = i_{BSI} \Rightarrow u_{is} = U_{BE} + \frac{V_{CC} R_B}{\beta R_C}$$

$$\begin{cases} i_B > i_{BSI} \Rightarrow T \text{ în SAT} \Rightarrow i_C = i_{CS} \\ i_B < i_{BSI} \Rightarrow T \text{ în RAN} \Rightarrow i_C = \beta i_B \\ i_B = i_{BSI} \Rightarrow U_{is} \end{cases}$$

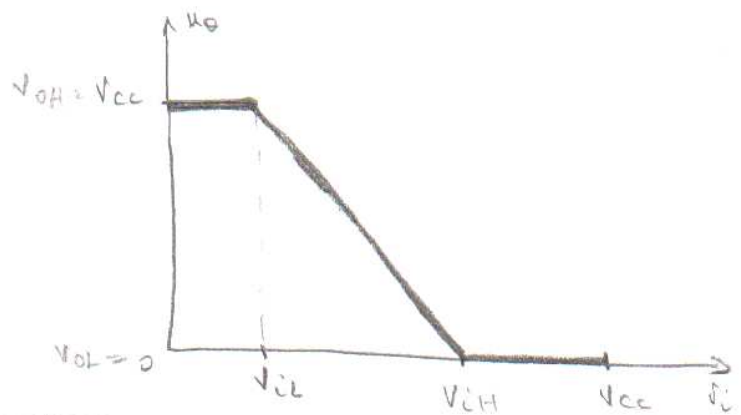
2



$$U_{BE} = 0,8V$$

$$U_{BE0} = 0,6V$$

$$\beta = 50$$



• pt $u_i = 0$ avem:

D_1 deschisă $\Rightarrow u_A = u_D \Rightarrow$

$\Rightarrow D_2, T_1, T_2$ blocați $\Rightarrow u_o = V_{cc} = V_{OH}$

• pt $u_i < V_{IL}$ avem:

T_2 blocați $\Rightarrow u_o = V_{cc}$

• pt $u_i = V_{IL}$ avem:

T_2 se deschide $\Rightarrow u_{B2} = U_{BE0}$

$$V_{IL} = \underbrace{U_{BE0}}_{T_2} + \underbrace{U_{BE}}_{T_1} + \underbrace{U_D - U_D}_{D_2 \ D_1} = 1,4V$$

• pt $u_i = V_{cc}$:

D_1 blocați, T_1, T_2 deschise

T_1 în RAN (pt că $u_{C1} = V_{cc} > U_{E1}$)

$$u_A = u_{E1} + U_{BE} + U_D$$

$$i_{B1} = \frac{V_{cc} - U_{BE} - U_D - u_{E1}}{R_1} \quad (1)$$

$$i_{E1} = \frac{u_{E1}}{R_2} + \frac{u_{E1} - U_{BE}}{R_3} \quad (2)$$

$$i_{E1} = \beta i_{B1} \quad (3)$$

(1), (2), (3) $\Rightarrow u_{E1} = \dots$

$$i_{B2} = \frac{u_{E1} - U_{BE}}{R_3}$$

$$i_{B2} > i_{B2si} = \frac{V_{CC}}{\beta R_4} = 0,1 \text{ mA} \Rightarrow T_2 \text{ saturat} \Rightarrow \boxed{u_o = 0 = V_{OL}}$$

• pt $\boxed{u_i > V_{iH}}$ avem
 T_2 saturat $\Rightarrow u_o = 0$

• pt $\boxed{u_i = V_{iH}}$ avem
 T_2 la saturatie incipienta

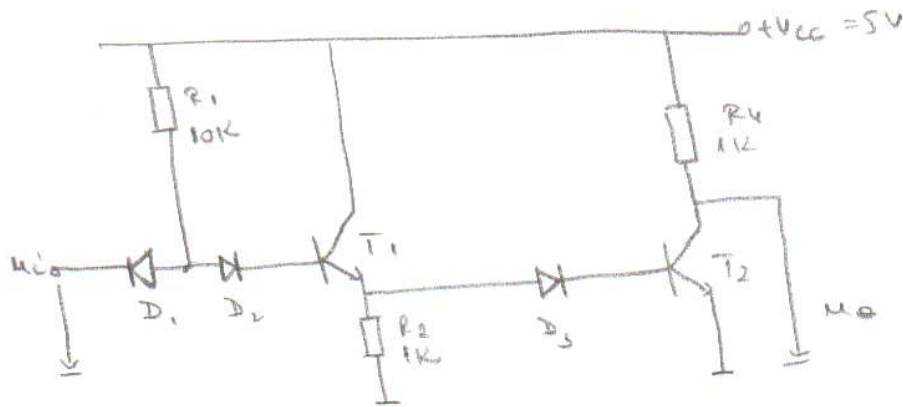
$$i_B(V_{iH}) = i_{B2si}$$

Δ , deschis

$$i_{B2} = \frac{u_i + \overbrace{U_D}^{\Delta_1} - \overbrace{U_D}^{\Delta_2} - \overbrace{U_{BE}}^{T_1} - \overbrace{U_{BE}}^{T_2}}{R_3} \quad \Rightarrow \quad \boxed{V_{iH} = 2U_{BE} + \frac{V_{CC}}{\beta} \cdot \frac{R_3}{R_4}}$$

$$i_{B2si} = \frac{V_{CC}}{\beta R_4}$$

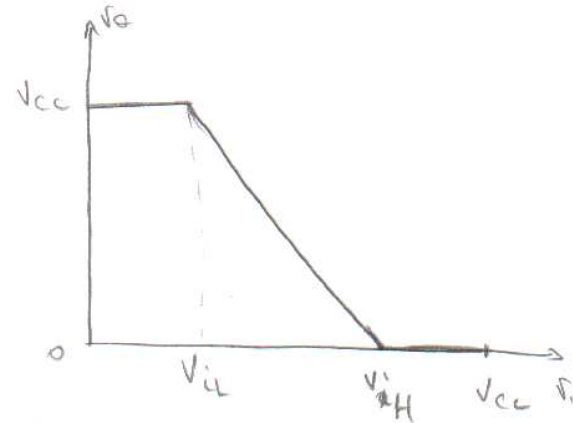
③



$$U_{BE} = 0,8V$$

$$U_{BE0} = 0,6V$$

$$\beta = 50$$



• $u_i = 0$ așem:

D_1 deschis $\Rightarrow u_A = u_D$

D_2, T_1, D_3, T_2 blocat $\Rightarrow u_o = V_{cc} = V_{OH}$

• $u_i < V_{IL}$ așem: T_2 blocat,

• $u_i \approx V_{IL}$ așem:

T_2 de deschide (simultan cu dioda D_3)

$$V_{IL} = \underbrace{V_{BE0}}_{T_2} + \underbrace{U_{D0}}_{D_3} + \underbrace{V_{BE}}_{T_1} + \underbrace{U_D - U_D}_{D_2 \text{ și } D_4} = 2V$$

• $u_i = V_{cc}$ așem:

D_1 bloc, D_2, D_3, T_1, T_2 deschis

T_1 în RAN ($u_{CE} > u_{E1}$)

$$i_{B1} = \frac{V_{cc} - 2U_{BE} - 2U_D}{R_1} = 0,18 \text{ mA}$$

$$i_{B2} = i_{E1} - i_{R2} = \beta i_{B1} - \frac{u_{D3} + U_{BE2}}{R_2} = 4,4 \text{ mA}$$

$$i_{B2} > i_{B2si} = \frac{V_{cc}}{\beta R_4} \Rightarrow T_2 \text{ sat} \Rightarrow u_o = 0 = V_{OL}$$

• $u_i > V_{iH}$ asem:

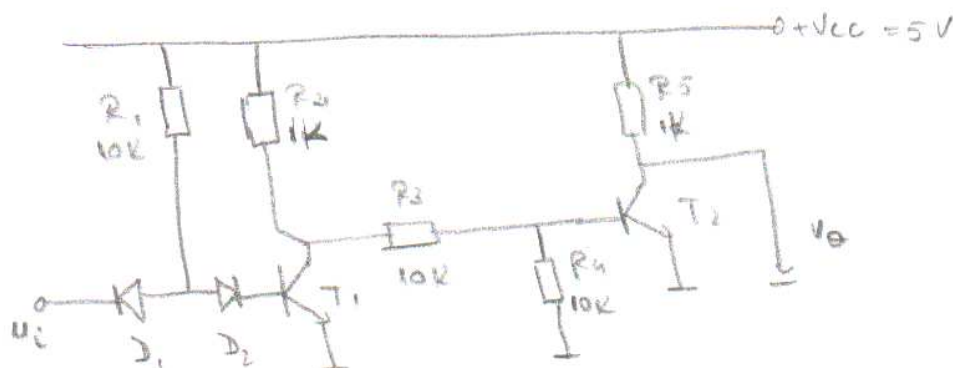
T_2 saturat, D_1 blocat.

• $u_i = V_{iH}$ asem:

D_1 se deschide / blochează

$$V_{iH} = \underbrace{2V_{BE}}_{T_{1,2}} + \underbrace{2V_D}_{D_{2,3}} - \underbrace{V_{D_1}}_{D_1} = 2,6V$$

③

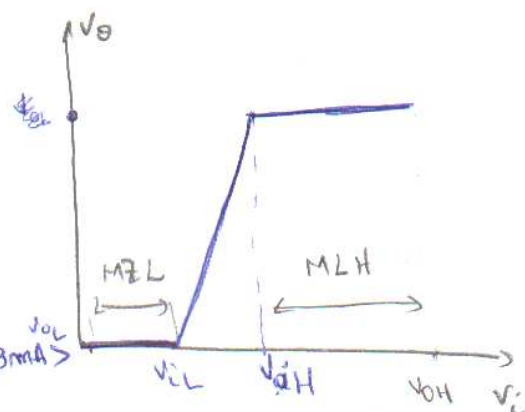


• $u_i = 0$ asem:

D_1 deschis $\Rightarrow D_2$ blocat, T_1 blocat
 T_2 deschis.

$$i_{B2} = i_{R3} - i_{R4} = \frac{V_{CC} - V_{BE}}{R_2 + R_3} - \frac{V_{BE}}{R_4} = 0,3mA$$

$$i_{B5,1} \geq \frac{V_{CC}}{\beta R_5} = 0,1mA \Rightarrow T_2 \text{ este saturat} \Rightarrow u_o = 0 = V_{oL}$$



• $u_i < V_{iL}$ asem:

T_2 saturat, T_1 blocat

• $u_i = V_{iL}$ asem T_2 la saturare incipientă $\Rightarrow i_{B2} = i_{B2,si}$

D_1, D_2 deschise, T_1 în RAN.

nu putem calcula $i_{B2}(u_i)$

• $u_i = V_{iH}$; T_1 se deschide

$$V_{iH} = \underbrace{V_{BE_1}}_{T_1} + \underbrace{V_{D_2}}_{D_2} - \underbrace{V_{D_1}}_{D_1} = 0,4V$$

- $u_i = V_{CC}$: D_1 lă ; T_1 des

$$i_{B1} = \frac{V_{CC} - U_D - U_{BE}}{R_1} = \dots > i_{B51} = \frac{V_{CC}}{\beta R_2} \Rightarrow T_1 \text{ saturat}$$

$$u_{C1} = 0 \Rightarrow T_2 \text{ lă } (u_o = V_{CC} = U_{OH})$$

- $u_i > V_{iH}$: T_2 lă , T_1 sat , D_1 blocați

- $u_i = V_{iH}$: D_1 se deschide (blochează)

$$V_{iH} = U_{BE} + U_D - U_{D0} = 1V$$

$$M\%H = V_{OH} - V_{iH}$$

$$M\%L = V_{iL} - V_{OL}$$

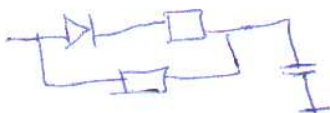
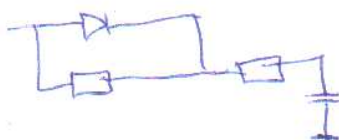
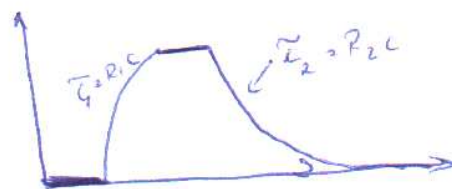
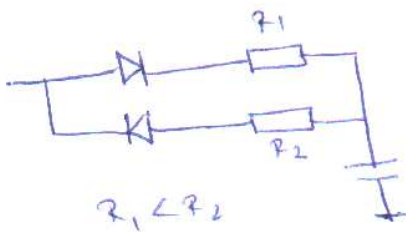
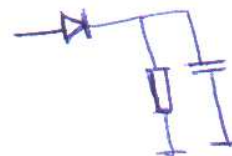
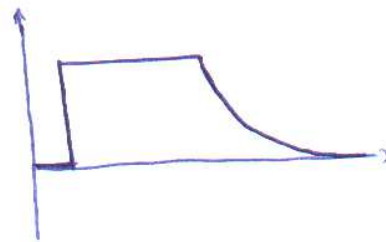
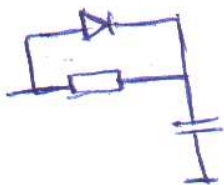
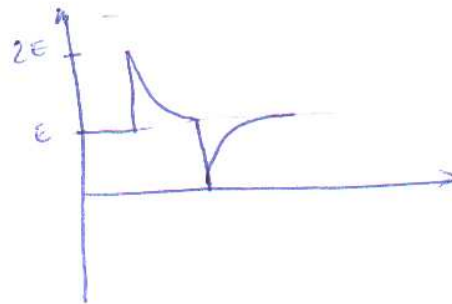
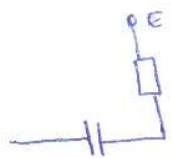
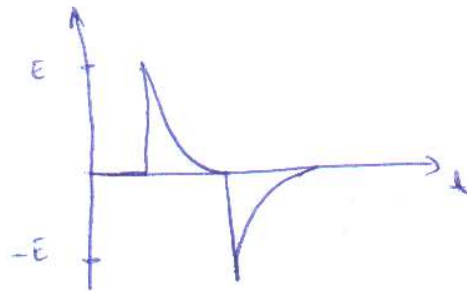
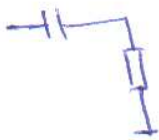
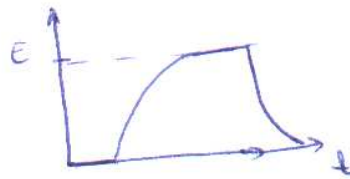
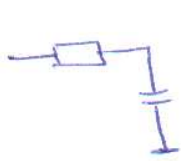
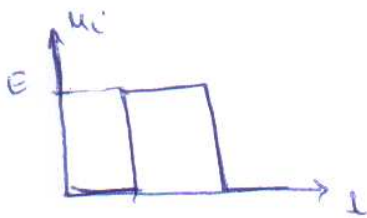
$$\left[m = \frac{i_B}{i_{B51}} - 1 \right] \quad (\text{în stare în care cele două tranzistoare saturează})$$

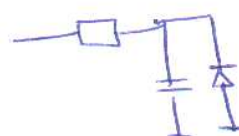
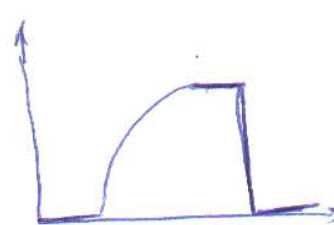
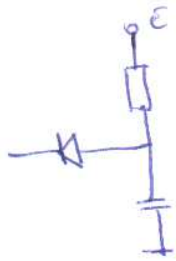
$$P_{d_{med}} = V_{CC} \cdot \frac{i_{CC1} + i_{CC2}}{2}$$

↓ pentru intrare suspendată, adică V_{CC}

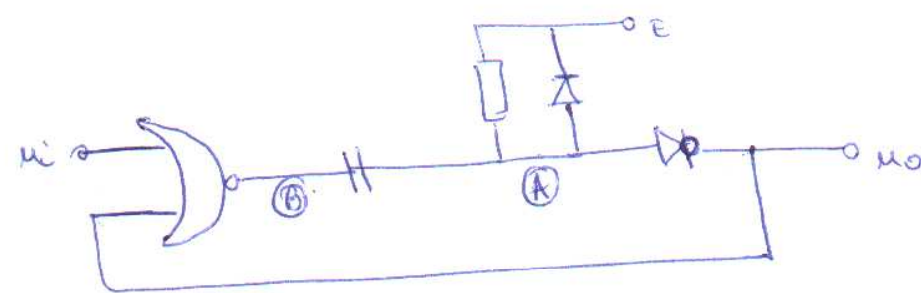
$$i_{CC1} = \underbrace{\frac{V_{CC} - U_D - U_{BE}}{R_1}}_{i_{R1}} + \underbrace{\frac{V_{CC}}{R_2}}_{i_{C1sat}}$$

$$i_{CC2} = \underbrace{\frac{V_{CC} - U_D}{R_1}}_{i_{R1}} + \underbrace{\frac{V_{CC} - U_{BE}}{R_2 + R_3}}_{i_{R2}} + \underbrace{\frac{V_{CC}}{R_5}}_{i_{C2sat}}$$





0	0	0	→	1
0	1	φ	→	0
1	0	φ	→	0
1	1	1	→	0



inițial, ținem condensatorul,
ca în A vom avea E

