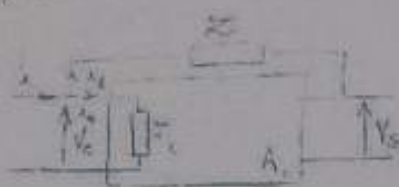


## Miller



$$A_v = \frac{V_s}{V_e}$$

gain de l'amplificateur

$$i = i_c + i_A = \frac{V_e}{Z_c} - \frac{V_s}{Z_c} = \frac{V_e}{Z_c} + \frac{V_e - A_v V_e}{Z_c} = \left( \frac{1}{Z_c} + \frac{1-A_v}{Z_c} \right) V_e$$

$$L \rightarrow i = \left( \frac{1}{Z_c} + \frac{1}{Z_c(1-A_v)} \right) V_e \quad Z_c = \frac{1}{sC} \quad (Z_c: \text{capacite})$$

$$\frac{1}{Z_{eq}} = \frac{1}{Z_c} \parallel \frac{1}{Z_c(1-A_v)} = \left( \frac{1}{Z_c} \parallel \frac{1}{Z_c(1-A_v)} \right) = \left( \frac{1}{Z_c} \parallel \frac{1}{Z_c(1-A_v)} \right)$$

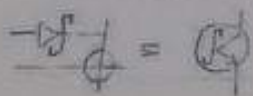


$C_D$  : capacite de diffusion (polarisation directe)  
 $C_T$  : capacite de transition (polarisation inverse)

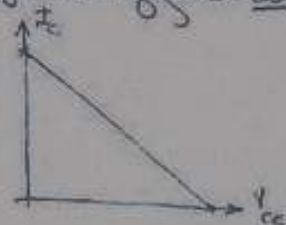
## TTL et CMOS, famille

TTL (Schottky) : utilise en HF qui permet l'acceleration de commutation (diode schottky)

- la notation



formule magique et diagramme magique  $V_{CE} = f(I_C)$



- limite de blocage  
 - limite de saturation

astable : pas de tension d'entree

Tension d'entree  $E$  instable ou bivalente

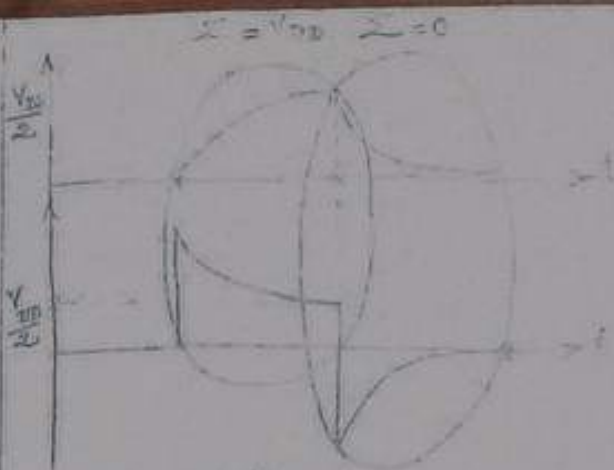
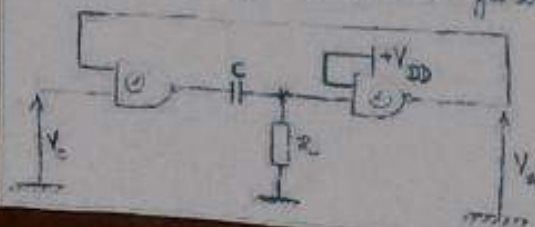
bivalente est symetrique (dense montage)

monostable est asymetrique (dense montage)

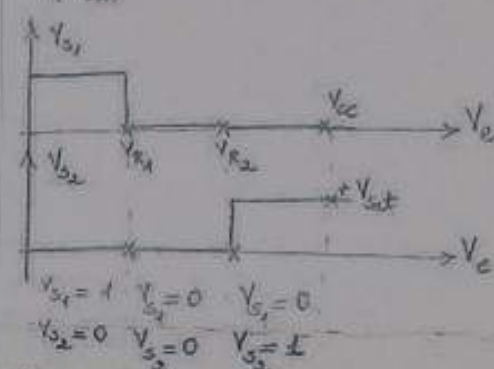
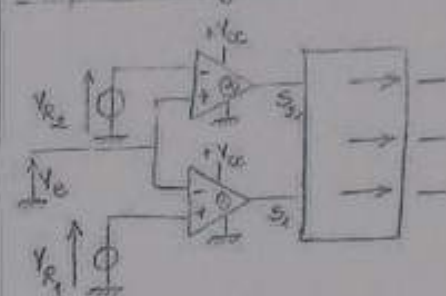
casuellement



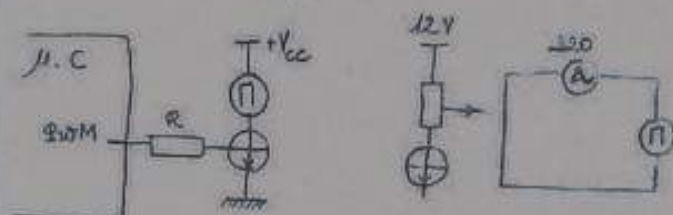
en transition :  $f_H \equiv$  fil conducteur



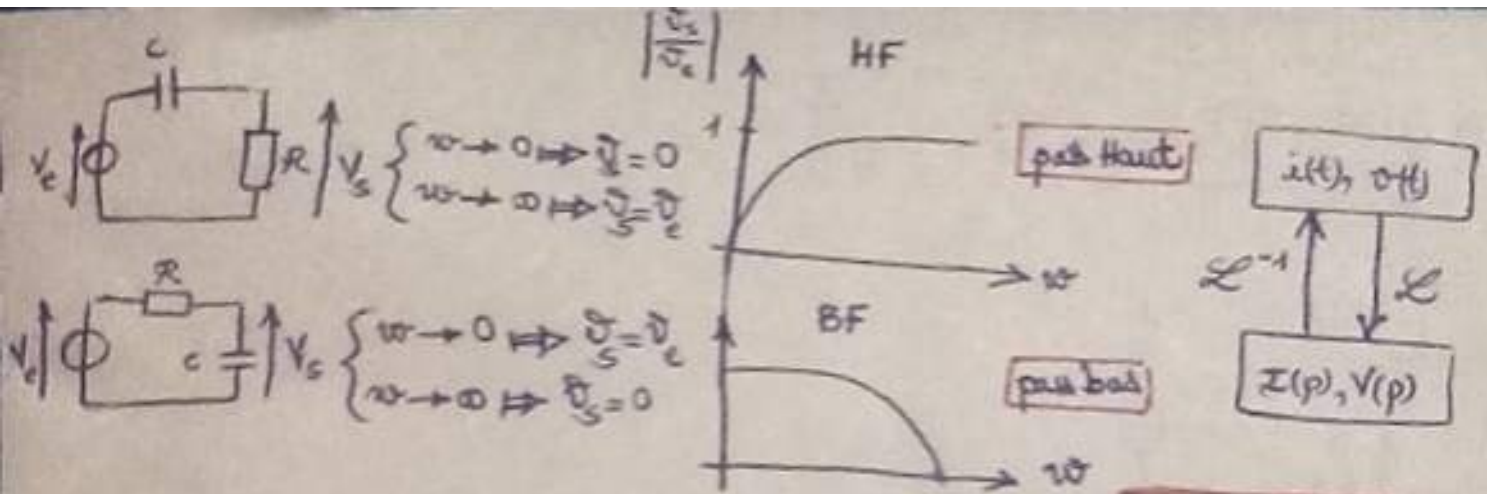
comparateurs a 3 entrées



activer une pompe : allumer, couper une LED (une pompe)  
 allumer une LED Rouge : allumer une LED Verte



Monostable à C.T. :  $f_H$  12 + 122...



$R$	$\ominus \frac{V}{R}$	$\ominus \frac{I}{R}$	$\frac{C}{s}$	$\frac{L}{s}$
$R$	$\ominus \frac{V}{R}$	$\ominus \frac{I}{R}$	$\frac{1}{sC}$	$\frac{1}{sL}$

change initiale de  $C$

- condensateur:
  - transitoire: —
  - permanent: —
- Inductance:
  - transitoire: —
  - permanent: —
- Resistance:
  - transitoire: —
  - permanent: —

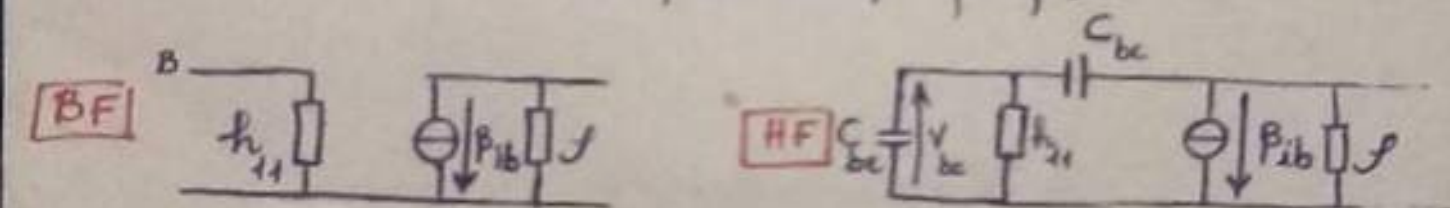
$$t = \tau \ln \left( \frac{V_F - V_i}{V_F - V} \right)$$

transistor bipolaire à jonction (TBJ):

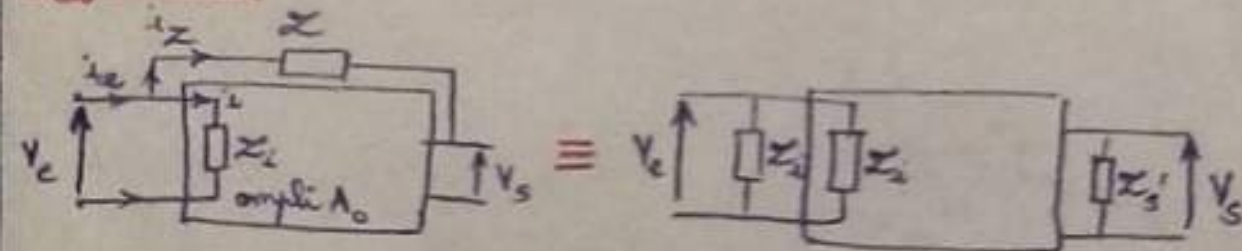
2 jonctions:  $j_{be}$  et  $j_{bc} \Rightarrow$  capacité de charge d'espace:  $C_D = \frac{ES}{d}$

$\hookrightarrow$  capacité de diffusion:  $d \searrow, C_D \gg \rightarrow C_D \approx 100 \mu F$

$\hookrightarrow$  capacité de  $\dots$ :  $d \nearrow, C_T \ll \rightarrow C_T = \text{quelques } \mu F$



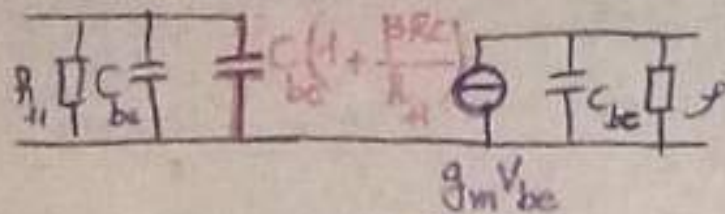
Effet Miller:



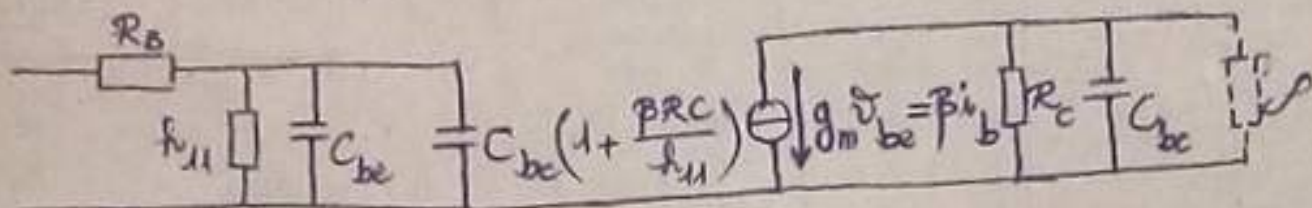
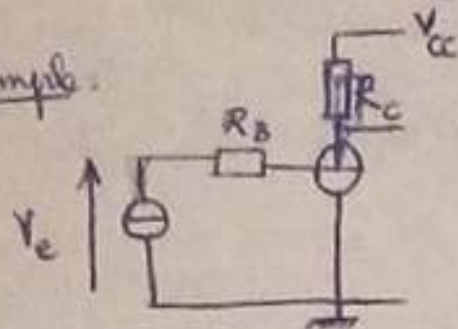
- En parallèle:  $R$  la plus petite gagne.
- En série:  $R$  la plus grande gagne.







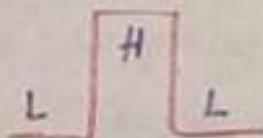
• exemple :



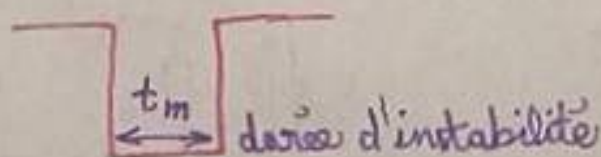
$$C_e = C_{be} + C_{bc} \left( 1 + \frac{\beta R_C}{h_{ie}} \right)$$

• multivibrateurs :

• bistable : basculement entre 2 états stables :

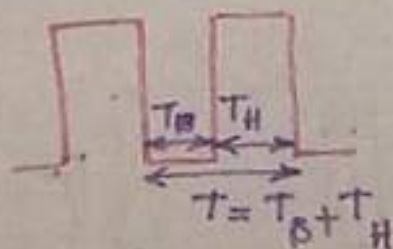


• monostable : basculement entre un état stable et un état instable



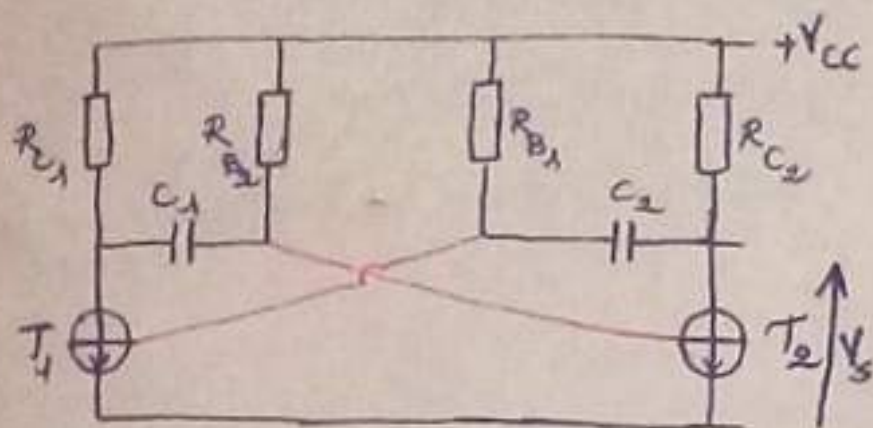
• astable : basculement entre 2 états instables,

n'admet pas une entrée !



$$\alpha = \frac{T_H}{T}$$

→ stable à TBj :



$$T_H = \tau_1 \ln\left(\frac{V_F - V_i}{V_F - V}\right)$$

$$\begin{cases} V_F = +V_{cc} \\ V_i = -V_{cc} + 0,6 \\ V = 0,6V \end{cases}$$

$$T_B = \tau_2 \ln\left(\frac{V_F - V_i}{V_F - V}\right)$$

$$\begin{cases} V_F = +V_{cc} \\ V_i = -V_{cc} + 0,6 \\ V = 0,6V \end{cases}$$

$$V_{cc} \gg 0,6$$

$$\text{donc: } \begin{cases} T_H = \tau_1 \ln\left(\frac{+V_{cc} - 0,6 + V_{cc}}{V_{cc} - 0,6}\right) \\ T_B = \tau_2 \ln\left(\frac{+V_{cc} - 0,6 + V_{cc}}{V_{cc} - 0,6}\right) \end{cases}$$

$$\Rightarrow \begin{cases} T_H = \tau_1 \ln\left(\frac{+2V_{cc}}{V_{cc}}\right) \\ T_B = \tau_2 \ln\left(\frac{+2V_{cc}}{V_{cc}}\right) \end{cases}$$

$$\hookrightarrow \begin{cases} T_H = \tau_1 \ln(2) \\ T_B = \tau_2 \ln(2) \end{cases}$$

$T_1$  bloqué,  $T_2$  saturé :

$$V_{BE2} = -V_{cc} + 0,6 \rightarrow 0,6 \text{ (normalement à } V_{cc})$$

$$V_{BE1} = 0,6$$

$$V_{CE2} = 0$$

$$V_{CE1} = +V_{cc}$$

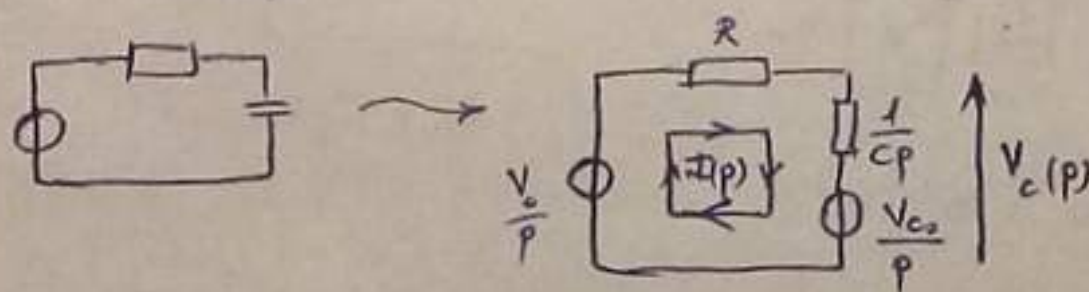
$T_2$  bloqué,  $T_1$  saturé :

$$V_{BE2} = 0,6$$

$$V_{BE1} = -V_{cc} + 0,6 \rightarrow 0,6 \text{ (normalement à } V_{cc})$$

$$V_{CE2} = +V_{cc}$$

$$V_{CE1} = 0$$



$$\Sigma f_{em} = \Sigma R_{maille} \times I$$

$$\frac{V_o}{p} - \frac{V_{co}}{p} = \left(R + \frac{1}{Cp}\right) I(p)$$

$$\Rightarrow I(p) = \frac{V_o - V_{co}}{p\left(R + \frac{1}{Cp}\right)}$$

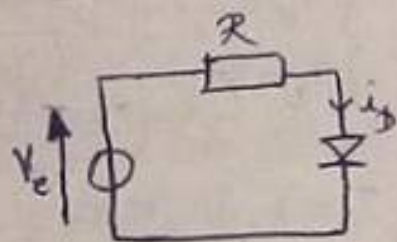
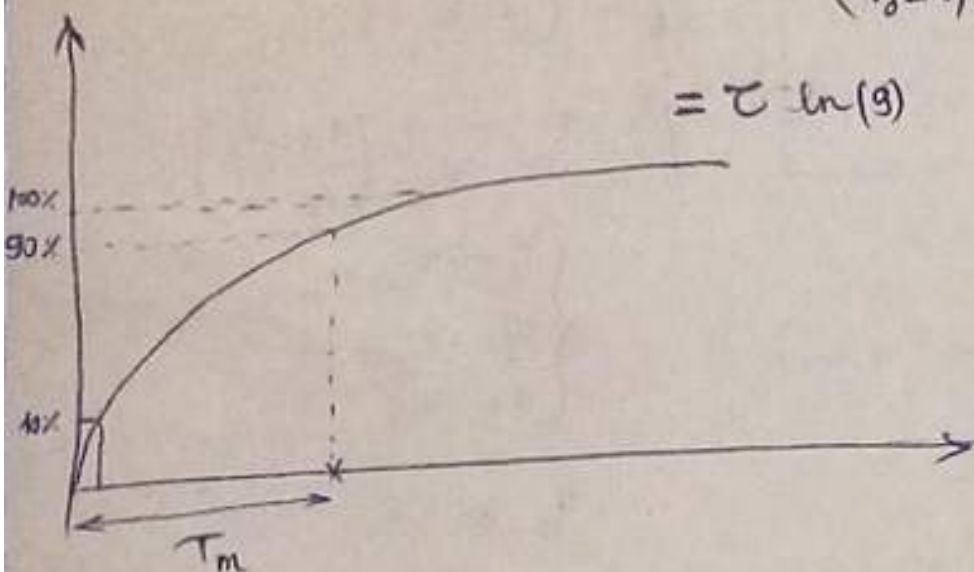
$$V_c(p) = \frac{V_{co}}{p} + \frac{I(p)}{Cp} = \frac{V_{co}}{p} + \frac{V_o - V_{co}}{Cp \times p\left(R + \frac{1}{Cp}\right)} = \frac{V_{co}}{p} + \frac{V_o - V_{co}}{Cp^2\left(R + \frac{1}{Cp}\right)} = \frac{V_{co}}{p} + \frac{V_o - V_{co}}{p(\tau p + 1)}$$



$$V_c(p) = \frac{V_{co}}{p} + \frac{V_o - V_{co}}{p(\tau p + 1)} \xrightarrow{\mathcal{L}^{-1}} V_c(t) = V_{co}(t) + (V_o - V_{co})(1 - e^{-\frac{t}{\tau}})$$

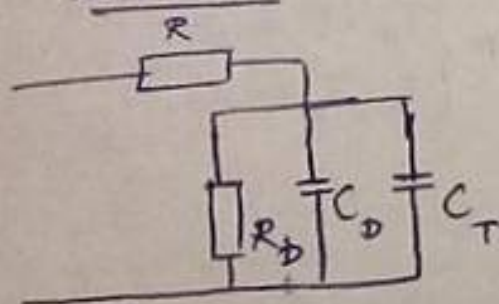
$$t = \tau \ln\left(\frac{V_o - V_{co}}{V_o - V_c}\right) \Rightarrow t_m = t(90\%) - t(10\%) = \tau \ln\left(\frac{V_o - V_{co}}{V_o - 0,9V_{co}}\right) + \tau \ln\left(\frac{V_o - V_{co}}{V_o - 0,1V_{co}}\right)$$

$$= \tau \ln(9)$$



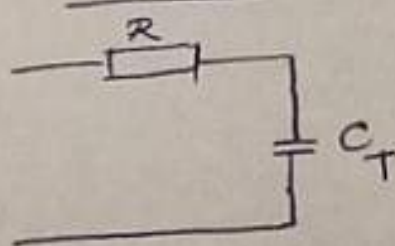
$$I_D = \frac{\sum f_{em}}{\sum R_{maille}}$$

sens direct :



$$Z_D = R_D \parallel (C_D + C_T)$$

en inverse :



$$Z_i = C_T R$$

directe			
inverse			

diode :

$$V_T = 0,6V$$