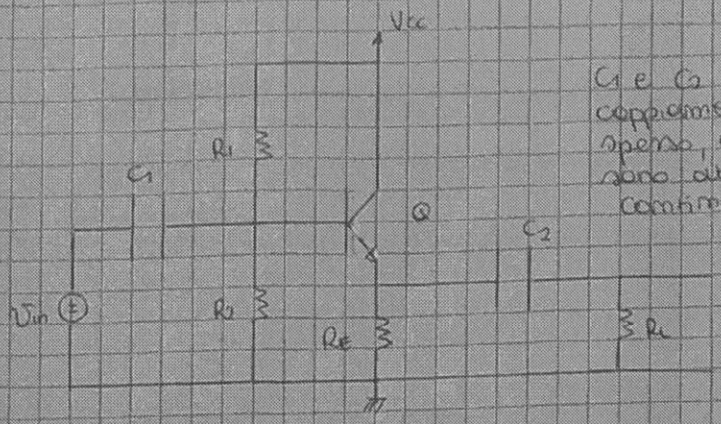
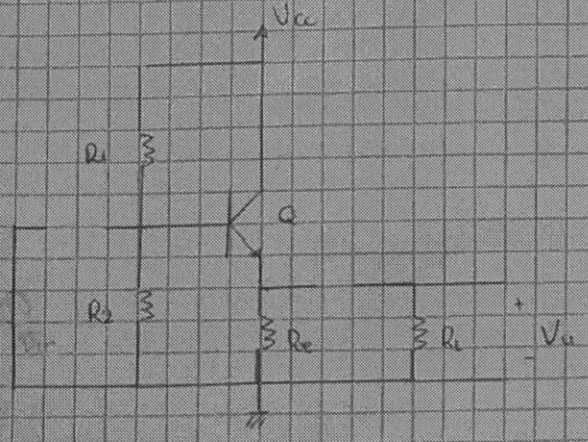
DOMANDE ORALE ANALOGICA

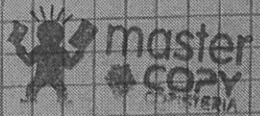
① Stadio a collettore comune + calcolo del punto di lavoro



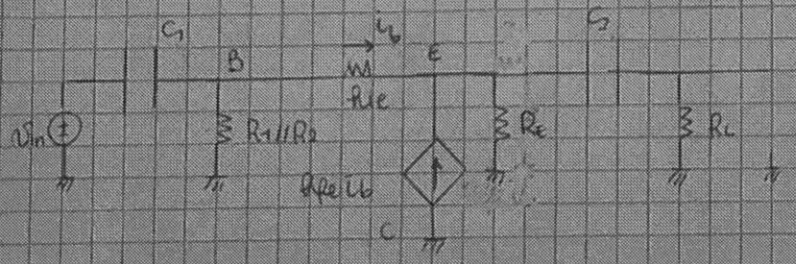
C_1 e C_2 sono condensatori di disaccoppiamento. Vengono messi perché, spenso, generatore e carico non sono attraversabili da correnti continue

Per il calcolo del punto di lavoro si analizza il circuito in continua:

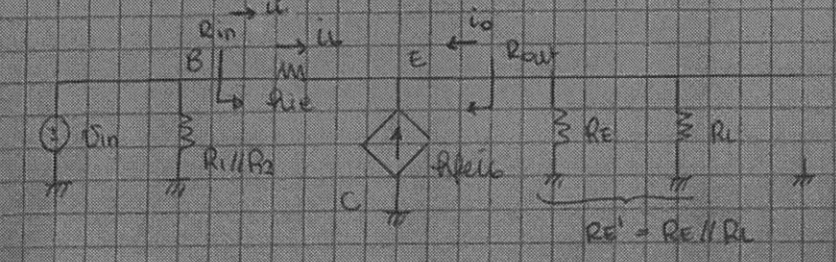




Dopo il calcolo di Q possiamo passare al circuito equivalente per le variabili:

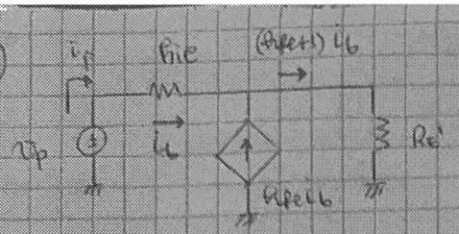


A frequenza "infinita":



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Rin



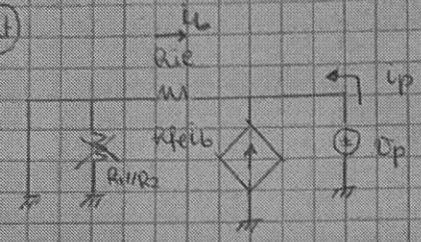
$R_E' = R_E \,//\, R_L$

$i_p = i_b$

$v_p = i_b R_{ie} + (R_{fe}+1) R_E' \, i_b$

$R_{in} = \frac{v_p}{i_p} = R_{ie} + (R_{fe}+1) R_E'$

Rout



$i_p = -(R_{fe}+1)\, i_b$

$v_p = -R_{ie}\, i_b$

$R_{out} = \frac{v_p}{i_p} = \frac{R_{ie}}{R_{fe}+1}$

Av

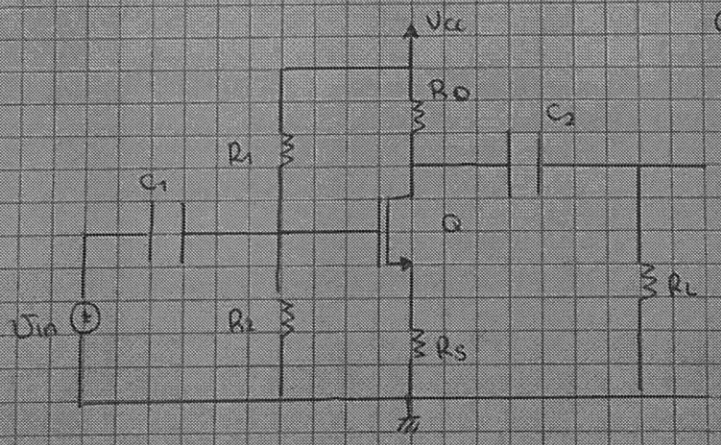
$v_u = (R_{fe}+1) R_E' \, i_b$

$v_i = i_b R_{ie} + (R_{fe}+1) R_E' \, i_b$

$\Rightarrow A_V(s) = \frac{v_u}{v_i} = \frac{(R_{fe}+1) R_E'}{R_{ie} + (R_{fe}+1) R_E'}$

Ai $i_i = i_b \qquad i_o = -(R_{fe}+1)\, i_b \qquad \Rightarrow A_i = \frac{i_o}{i_i} = -(R_{fe}+1)$

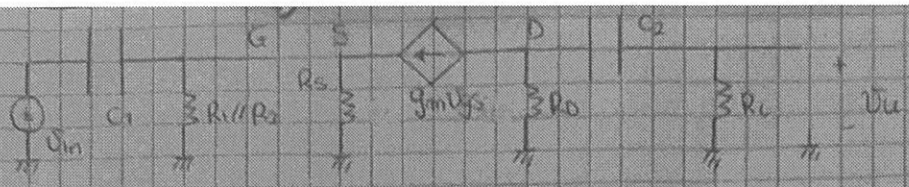
② Stadio a source comune



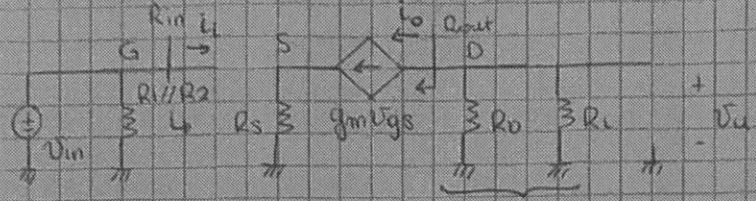
C1 e C2 sono condensatori di disaccoppiamento

Dopo aver calcolato il punto di lavoro (circuito in continua) possiamo passare al circuito per le variazioni.

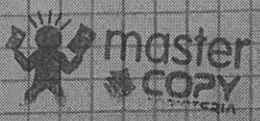
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A frequenza intermedia

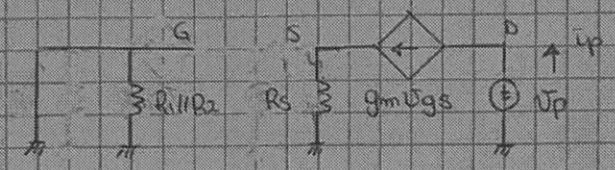


$R_D' = R_D // R_L$



(Rin) $i_p = 0 \Rightarrow R_{in} = \frac{v_p}{i_p} = \infty$

(Rout)



$i_p = g_m v_{gs}$

$v_{gs} = v_g - v_s = -v_s = -g_m v_{gs} R_s \Rightarrow v_{gs}(1 + g_m R_s) = 0 \Rightarrow v_{gs} = 0$

$\Rightarrow i_p = 0 \Rightarrow R_{out} = \frac{v_p}{i_p} = \infty$

(Av) $v_u = -g_m v_{gs} R_D'$

$v_{gs} = v_g - v_s = v_g - g_m v_{gs} R_s \Rightarrow v_{gs} = \frac{v_g}{1 + g_m R_s} = \frac{v_{in}}{1 + g_m R_s}$

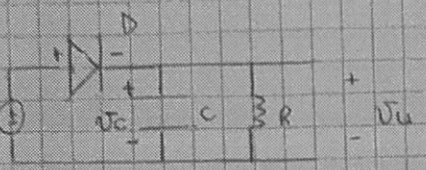
$\Rightarrow A_v(s) = \frac{v_u}{v_{in}} = -\frac{g_m R_D'}{1 + g_m R_s}$

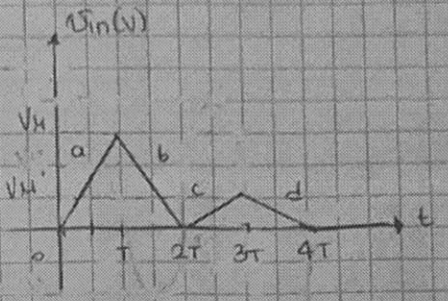
(Ai) $i_i = 0 \Rightarrow A_i = \frac{i_o}{i_i} = \infty$

Scansionato con CamScanner

⑥ Rivelatore di inviluppo

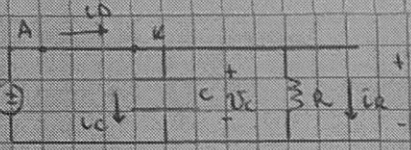
Rivelatore di inviluppo positivo





$v_c(0) = 0$, D ideale

- $t > 0 \rightarrow$ D conduce



$v_u = v_{in}$ $v_c = v_{in}$

$i_D = i_C + i_R = C\frac{dv_c}{dt} + \frac{v_{in}}{R} =$

$= C\frac{dv_{in}}{dt} + \frac{v_{in}}{R} > 0$

Sicuramente è vero fino a $t = T$

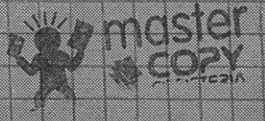
Per $t > T$ si ha $\frac{dv_{in}}{dt} < 0$

a) $\frac{V_M}{T}t$ b) $-\frac{V_M}{T}t + 2V_M$ c) $\frac{V_M'}{T}t + 2V_M'$ d) $-\frac{V_M'}{T}t + 4V_M'$

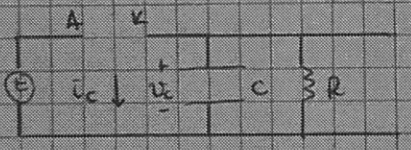
Valuto ora per $t > T$: $i_D = C\left(-\frac{V_M}{T}\right) - \frac{V_M}{RT}t + \frac{2V_M}{R} > 0 \iff$

$\frac{V_M}{RT}t < \frac{2V_M}{R} - C\frac{V_M}{T} \iff \frac{t}{RT} < \frac{2}{R} - \frac{C}{T} \iff t < \underbrace{2T - RC}_{t^*}$

$\rightarrow i_D > 0$ vero fino a $t^* > T$



- $t > t^* \rightarrow$ D interdetto



$i_C = C\frac{dv_c}{dt} = 0 \iff v_c = \text{cost} = v_c(t^*)$

$v_u = v_c(t^*)\, e^{-\frac{t - t^*}{RC}}$

$v_{AK} = v_{in} - v_u < 0 \iff v_{in} < v_u$ vero fino a t° in cui $v_{in} = v_u$

$2T < t^\circ < 3T$

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$t > t^\circ \rightarrow$ D conduce

$i_D = i_C + i_R = C\frac{dV_{in}}{dt} + \frac{V_{in}}{R} > 0$ vero tra $t^\circ < t < 3T$

Per $t > 3T$ $\frac{dV_{in}}{dt} < 0$, devo valutare l'altro termine:

$i_D = C\left(-\frac{V_M'}{T}\right) + \frac{4V_M'}{R} - \frac{V_M' t}{RT} > 0$ (*) $\frac{V_M' t}{RT} < V_M'\left(\frac{4}{R} - \frac{C}{T}\right)$ (-)

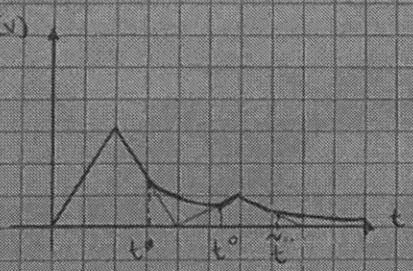
$t < \underbrace{4T - RC}_{\tilde{t}}$ $\quad \tilde{t} < 4T$

$t > \tilde{t} \rightarrow$ D interdetto

$i_C = C\frac{dV_C}{dt} = 0 \Rightarrow V_C = cost = V_C(\tilde{t})$

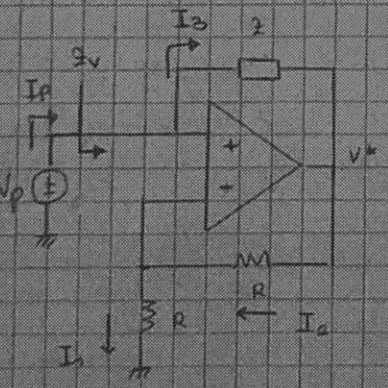
$V_u = V_C(\tilde{t})\, e^{-\frac{t-\tilde{t}}{RC}}$

$V_{AK} = V_{in} - V_u < 0$ vero per $t > \tilde{t}$



Il rivelatore di inviluppo è un circuito con memoria (dove l'uscita dipende da ingresso e stato) che rivela l'inviluppo positivo o negativo dell'ingresso

④ NIC



Per ie ccv: $V^+ = V^- = V_p$

$I_1 = I_2 = \frac{V^-}{R} = \frac{V_p}{R}$

$I^- = 0$

$V^* = I_2 R + V_p = 2V_p$

$I_3 = I_p \quad (I^+ = 0)$

$V^* = V^+ - I_3 Z = V_p - I_p Z = 2V_p$

$V_p = -I_p Z$

$Z_V = \frac{V_p}{I_p} = -Z$

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