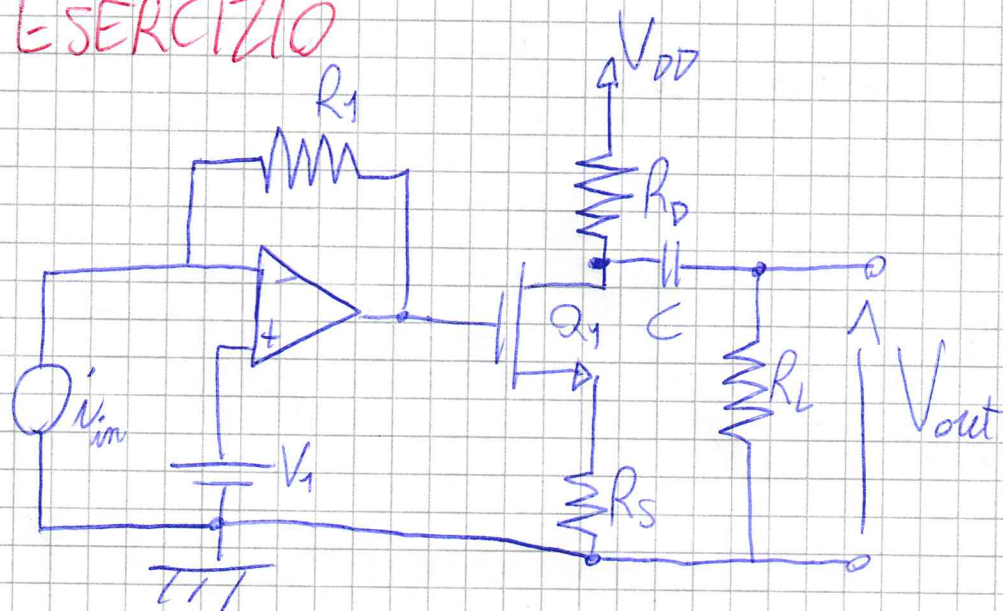


# ESERCIZIO



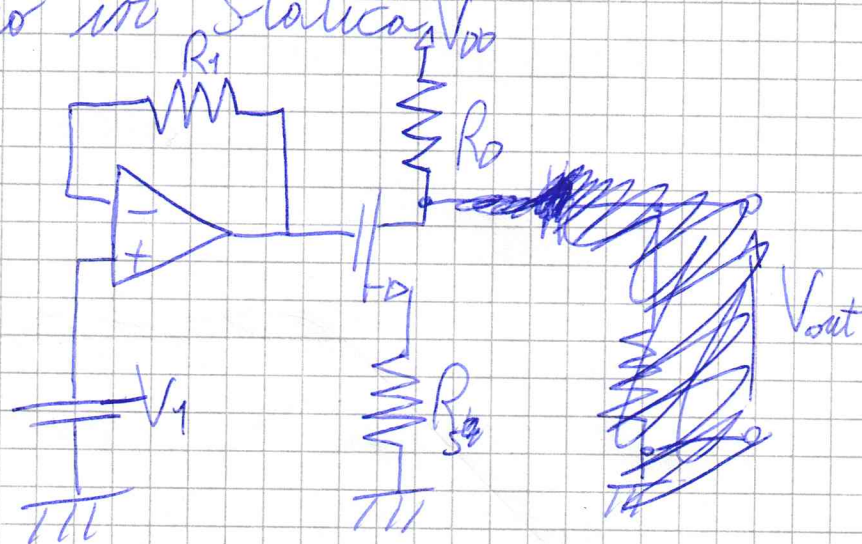
$$Q_1 = \left\{ V_t = 2V; K = 2 \frac{mA}{V^2}; \lambda = 0 \right\}$$

$$V_1 = 5V \quad V_{DD} = 12V \quad C = \infty$$

$$R_1 = 10k\Omega \quad R_L = 10k\Omega \quad R_D = 2k\Omega \quad R_S = 1k\Omega$$

$$L^+ = |L^-| = 12V$$

Studio in statica





$$V_{OA} = V_G = V_1 = 5V$$

$$\begin{cases} V_{GS} = V_G - V_S = 5 - i_D R_S \\ i_D = K(V_{GS} - V_t)^2 \end{cases}$$

$$V_{GS} = 5 - 2(V_{GS} - 2)^2$$

$$5 - V_{GS} = 2(V_{GS}^2 - 4V_{GS} + 4)$$

$$5 - V_{GS} = 2V_{GS}^2 - 8V_{GS} + 8$$

$$2V_{GS}^2 - 7V_{GS} + 3 = 0$$

$$\Delta = 49 - 24 = 25$$

$$V_{GS_{1,2}} = \frac{7 \pm 5}{4} = \begin{cases} 3V > V_t = 2V \\ 0.5V \end{cases} \quad (\checkmark)$$

$$V_{GS} = 3V$$

$$i_D = 2(3 - 2)^2 = 2mA$$

$$V_{DS} = V_{DD} - i_D R_D - i_D R_S = 12 - 4 - 2 = 6V > V_{GS} - V_t = 1$$

(✓)

Transistor in saturazione con

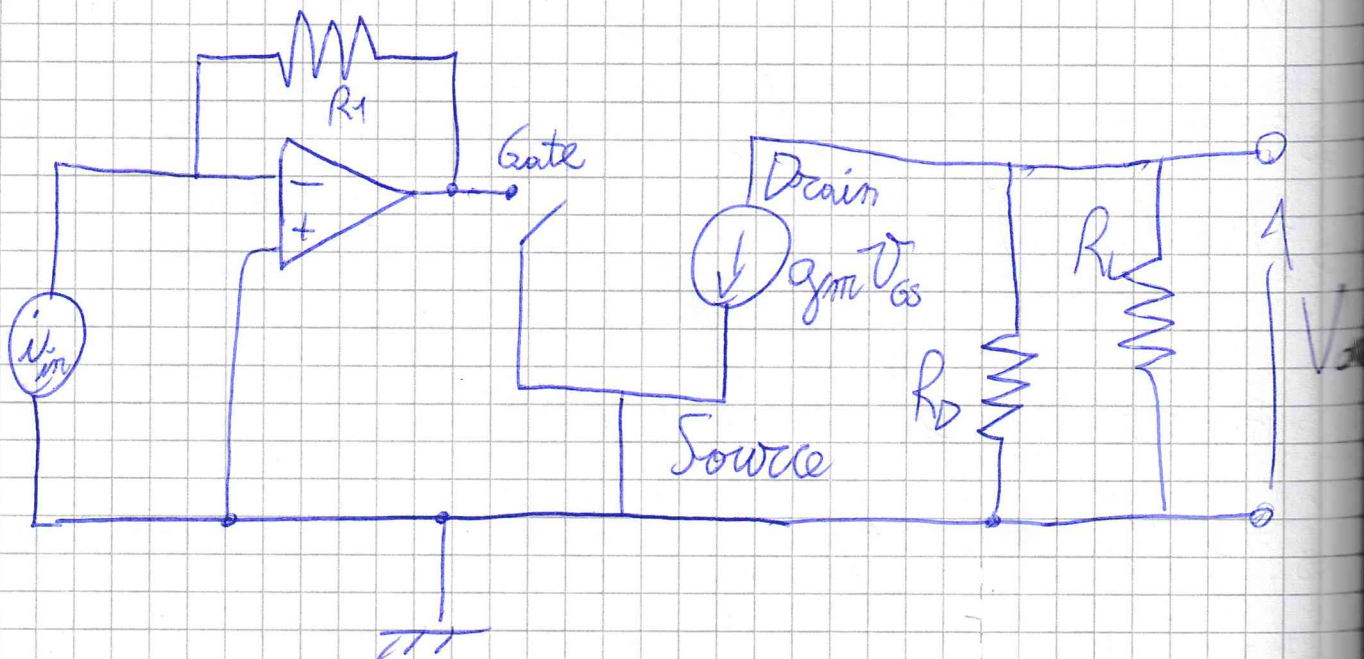
$$V_{GS} = 3V$$

$$V_{DS} = 6V$$

$$i_D = 2mA$$



# Piccoli segnali



$$V_{gs} = R_1 i_{in} = 10 i_{in}$$

$$g_m = 2K(V_{gs} - V_t) = 4(10 i_{in} - 2) = 40 i_{in} - 8$$

$$V_{out} = -g_m V_{gs} \frac{R_D R_L}{R_D + R_L} = -g_m V_{gs} \frac{20 \times 10^5}{12 \times 10^3}$$

Mi chiede di calcolare la transresistenza

$$R_{in} = \frac{V_{out}}{i_{in}}$$

soltanto che mi sono bloccato, poiché sostituendo i valori che trovato mi trovo un  $i_{in}^2$