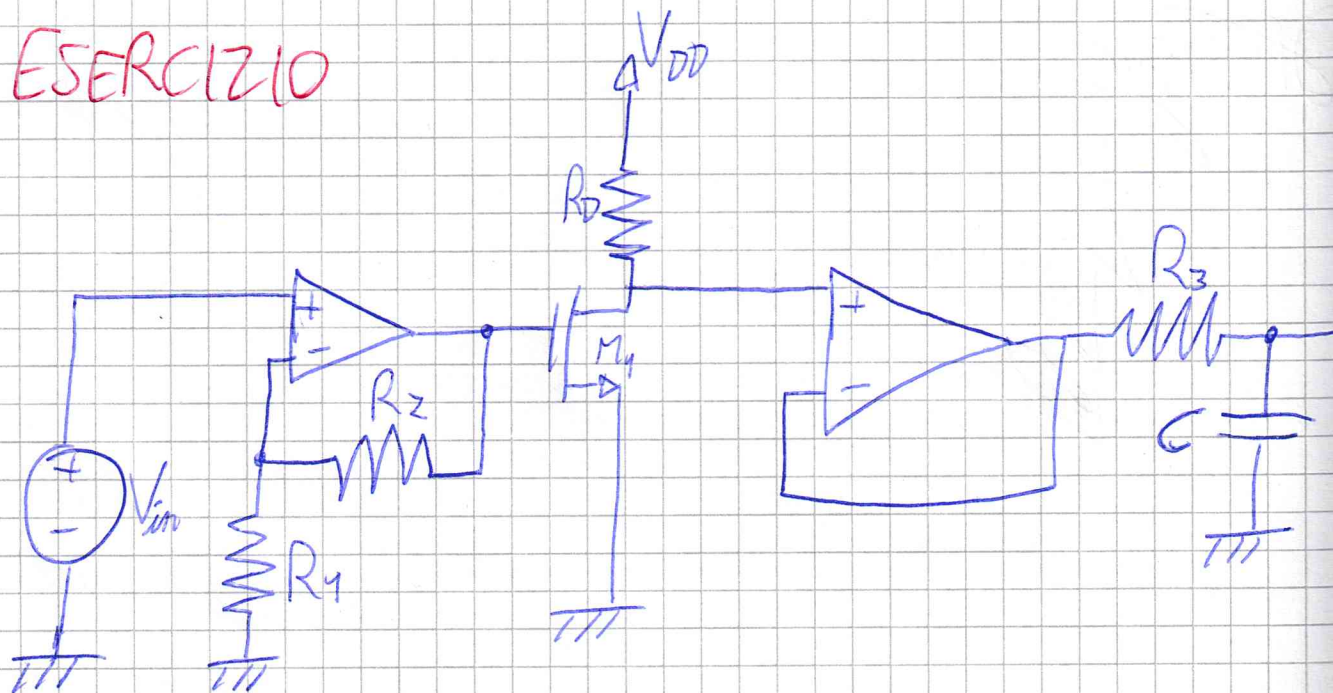


# ESERCIZIO



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

$$M_1 = \left\{ K = 0,5 \frac{\mu A}{V^2}; V_t = 1V; \lambda = 0 \right\}$$

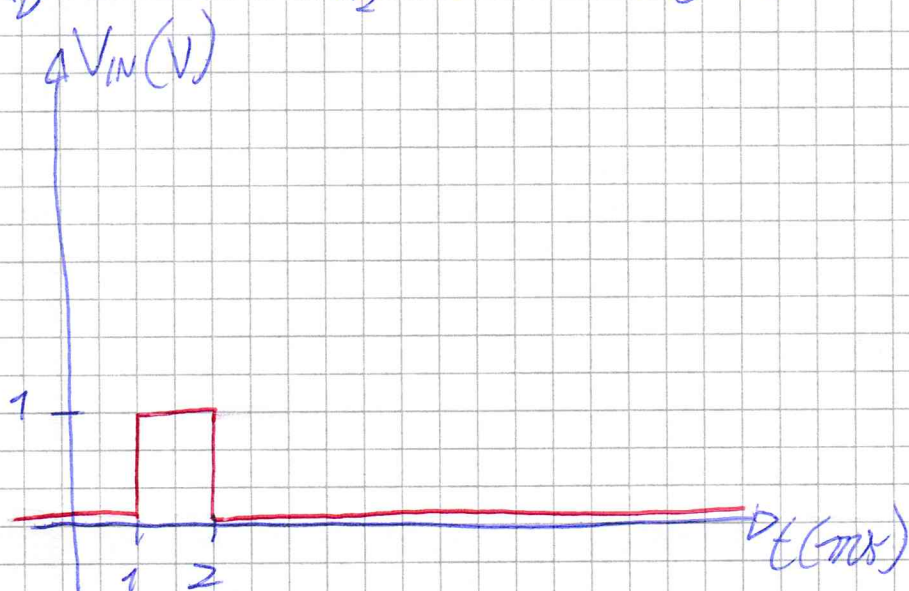
$$V_{DD} = 5V$$

$$C = 10 \text{ nF}$$

$$R_1 = R_D = 1 \text{ k}\Omega$$

$$R_2 = 1 \text{ k}\Omega$$

$$R_3 = 10 \text{ k}\Omega$$



$$V_G = V_{O1} = V_{in} \left( 1 + \frac{R_2}{R_1} \right)$$

si hanno 2 casi  $V_{in} = 0$  e  $V_{in} = 1V$

$$V_{in} = 0V$$

$$V_G = 0V$$

$$V_{GS} = V_G - V_S = 0V < V_{t1} = 1V$$

$M_1$  interdetto

$$V_2^+ = V_D = V_{DD} - i_D R_D = V_{DD} = 5V$$

$$i_D = 0mA$$

$$V_{O2} = V_2^+ = 5V$$



$$V_{in} = 1V$$

$$V_G = V_{O1} = V_{in} \left( 1 + \frac{R_2}{R_1} \right) = 1(1+2) = 3V$$

$$V_{GS} = V_G - V_S = V_G = 3V > V_t = 1V$$

$$V_{DS} = V_D - V_S = V_{DD} - i_D R_D = 5 - 2 = 3V$$

$$i_D = K(V_{GS} - V_t)^2 = \frac{1}{2}(3-1)^2 = 2mA$$

$$V_{DS} = 3V > V_{GS} - V_t = 3 - 1 = 2V$$

$M_1$  in saturazione

$$V_2^+ = V_D = V_{DD} - i_D R_D = 3V$$

$$V_{O2} = V_2^+ = 3V$$

$$\tau = CR_3 = 10 \cdot 10^{-9} \cdot 10 \cdot 10^3 = 100 \cdot 10^{-6} = 0,1 \cdot 10^{-3} = 0,1ms$$

