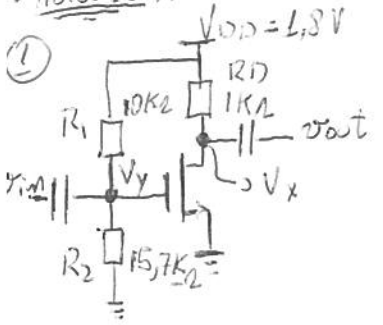
• Aula 10 A

① 

• $\frac{W}{L} = \frac{10}{0,18}$ • $V_{TH} = 0,5$ • $u_n C_{ox} = 100\,uA/V^2$

• A_v? • Z_{in}? • Z_{out}? • v_{in} máx? Lim.

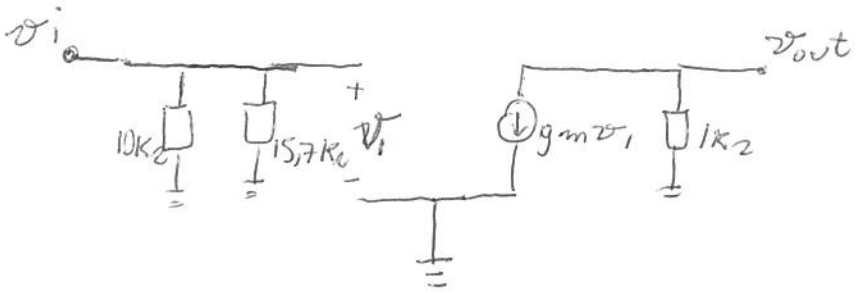
• $V_{GS} = \frac{1,8}{10+15,7} \cdot 15,7 \Rightarrow \boxed{V_{GS} = 1,0996\,V}$

$$I_D = \frac{1}{2} \cdot 100.10^{-6} \cdot \frac{10}{0,18} \cdot (1,0996-0,5)^2 \Rightarrow \boxed{I_D = 9,987.10^{-4}\,A}$$

* $V_{DS} = 1,8 - 1.10^3 \cdot 9,987.10^{-4} \Rightarrow V_{DS} = 0,8013 > V_{GS}-V_{TH} \Rightarrow SAT \Rightarrow OK$

* $g_m = \sqrt{2 I_D u_n C_{ox} \frac{W}{L}} = \sqrt{2 \cdot 9,987.10^{-4} \cdot \frac{10}{0,18} \cdot 100.10^{-6}} \Rightarrow \boxed{g_m = 3,3312\,mS}$

⇒ Modelo de pequenos sinais

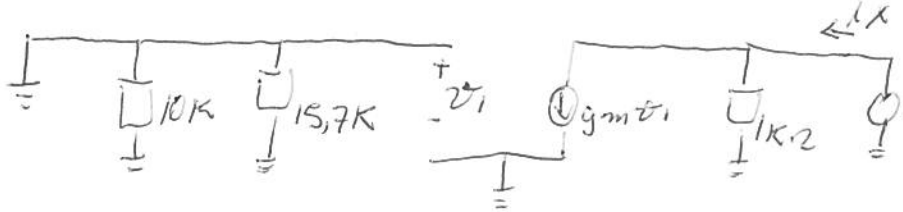


• $v_i = v_1$ • $v_{out} = -g_m v_1 \cdot 1.10^3$ / $3,33.10^{-3}$

• $A_v = \frac{v_{out}}{v_i} \Rightarrow \boxed{A_v = -3,3312}$

• $Z_{in} = 10 // 15,7 \Rightarrow \boxed{Z_{in} = 9,99\,K\Omega}$

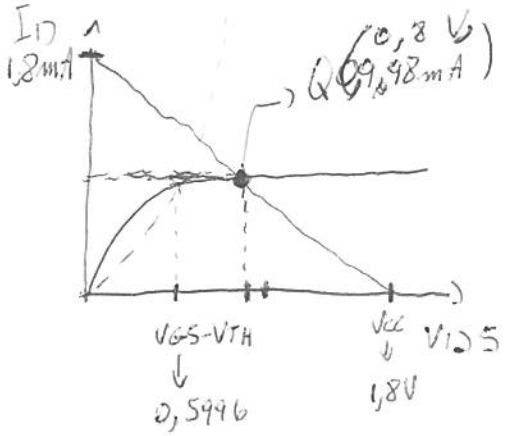
• Z_{out}



$v_1 = 0 \Rightarrow g_m v_1 = 0$

$\therefore \boxed{Z_{out} = 1K\Omega}$

$\rightarrow R_D$



- Saturação → ≠ do livro
  - $V_x = V_{ds} = V_{DS} + v_{out} = V_{DS} + A_v v_{in} \Rightarrow \boxed{V_x = 0,8013 - 3,33 v_{in}}$
  - $V_y = V_{GS} + v_{in} \Rightarrow \boxed{V_y = 1,0996 + v_{in}}$
  - $V_x > V_y - V_{TH} \Rightarrow 0,8013 - 3,33 v_{in} > 1,0996 + v_{in} - 0,5$
    $\Rightarrow \boxed{v_{in} < 0,0474\ V}$

- Corte

1-) $V_y > V_{TH} \Rightarrow 1,0996 + v_{in} > 0,5 \Rightarrow \boxed{V_{in} > -0,5996\ V}$

2-) $V_x < V_{CC} \Rightarrow 0,8013 - 3,33 v_{in} < 1,8 \Rightarrow \boxed{v_{in} > -0,2995\ V}$

$\therefore \boxed{-0,2995 < v_{in} < 0,0474}$