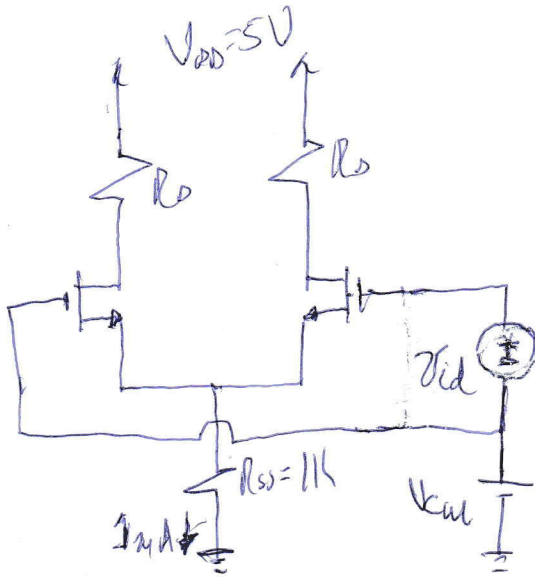


PROBLEMA #1.

Parcial I

3/5/2020

D7.17 DEL SPOT



$$K_n = 2.5 \text{ mA/V}^2$$

$$V_t = 0.7 \text{ V}$$

$$\lambda = 0$$

I de polarización
es de 1mA

a) Valor requerido
de V_{cm}

b) Valor de R_o
para una $A_d = 8 \text{ V/V}$

c) Voltaje de CC
en los drenajes

d) $\Delta V_{D1}/\Delta V_{in}$
(Tomar en cuenta $\frac{1}{g_m}$)

$$a) V_s = 1k \times 1mA = 1 \text{ V}$$

$$I_{D1} = I_{D2} = 0.5 \text{ mA} \text{ en MC}$$

$$0.5 \text{ mA} = \frac{1}{2} \cdot 2.5 \text{ mA/V}^2 (V_{GS} - 0.7)^2$$

$$V_{GS1} = 1.33 \text{ V} \checkmark$$

$$V_{GS2} = -0.068 \text{ V} \times$$

$$V_{MC} = 1 + 1.33 \text{ V} = 2.33 \text{ V}$$

$$b) A_d = g_m R_o$$

$$g_m = \frac{I}{V_{GS} - V_t} = \frac{1 \text{ mA}}{1.33 - 0.7} = 1.58 \text{ mA/V}$$

$$R_o = 8 / 1.58 \text{ mA} = 5059.64 \Omega$$

$$c) V_{D1} = V_{D2} = 5 - 5059.64 \times 0.5 \text{ mA}$$

$$V_{D1} = V_{D2} = 2.47 \text{ V}$$

e) Use la ganancia en AC
encontrada en d) para
determinar el cambio en
 V_{MC} que da como re-
sultado que Q_1 y Q_2
entran en la región
de triodo.

$$\Delta V_{D1} = -R_o g_m \Delta V_{gs}$$

$$\Delta V_{MC} - \Delta V_{gs} - 2g_m \Delta V_{gs} R_{ss} = 0$$

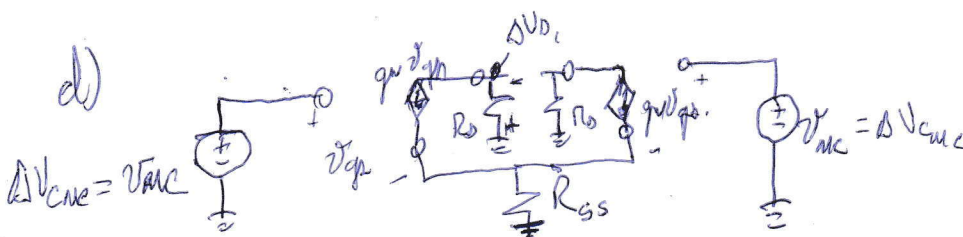
$$\Delta V_{MC} = \Delta V_{gs} [1 + 2g_m R_{ss}]$$

$$\Delta V_{gs} = \frac{\Delta V_{MC}}{1 + 2g_m R_{ss}}$$

$$\Delta V_{D1} = \frac{-R_o g_m \Delta V_{MC}}{1 + 2g_m R_{ss}}$$

$$\frac{\Delta V_{D1}}{\Delta V_{MC}} = \frac{-g_m R_o}{1 + 2g_m R_{ss}}$$

$$A_{MC} = \frac{R_o}{\frac{1}{g_m} + 2R_{ss}}$$



$$A_{mc} = \frac{-1,58 \text{ m} \times 5.059 \text{ K}}{1 + 2 \times 1,58 \text{ m} \times 1 \text{ K}} = -1,92 \text{ V/V}$$

e) Con excitación en AC de $V_{en} = 2.33 \text{ V}$
 y $I = 1 \text{ mA}$

$$V_{D1} = V_{D2} = 5 - 5.059 \text{ K} \times 0,5 \text{ m} = 2,47 \text{ V}$$

$$V_{GD} = V_t \quad \text{PARA ENTRAR EN TRIODO}$$

$$V_G - V_D = 0,7$$

$$(2,33 + \Delta V_{mc}) - \left(2,47 + \underbrace{\left(\frac{\Delta V_D}{\Delta V_{mc}} \right)}_{A_{mc}} \Delta V_{mc} \right) = 0,7$$

$$2,33 + \Delta V_{mc} = 2,47 - (-1,92) \Delta V_{mc} = 0,7$$

$$2,92 \Delta V_{mc} = 0,7 + 2,47 - 2,33$$

$$\Delta V_{mc} = \frac{0,84}{2,92}$$

$$\Delta V_{mc} = 0,288 \text{ V}$$