练习8.4

(1) $V_0 = -\frac{k}{2}(V_1-V_T)^2 R_L + V_S$

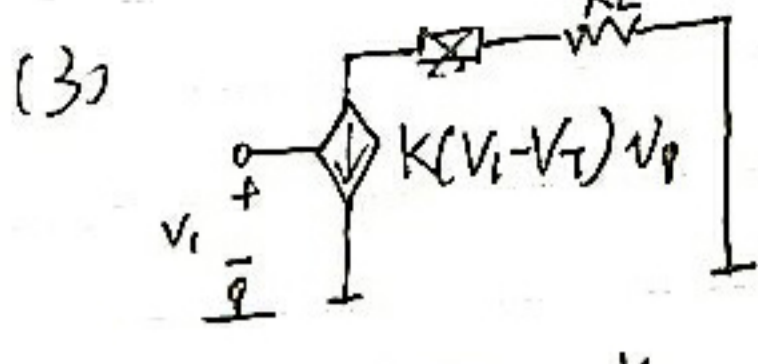$V_0 = V_S - \frac{k}{2}(V_1-V_T)^2 R_L.$

$I_{DS} = \frac{k}{2}(V_1-V_T)^2$

(2) $ids = K(V_1-V_T)v_1$

$v_0 = -ids R_L = -K(V_1-V_T)v_1 R_L$

$|\frac{v_0}{v_1}| = K(V_1-V_T)R_L.$

(3)

(4) 利 $I_{DS} + ids = \frac{k}{2}(V_1+v_1-V_T)^2.$

$\frac{k}{2}(V_1-V_T)^2 + ids = \frac{k}{2}(V_1-V_T)^2 + K(V_1-V_T)v_1 + \frac{k}{2}v_1^2$

$ids = K(V_1-V_T)v_1$ 二者表达式相同

(5) R_L 变为 $2R_L$ 会使增益加倍

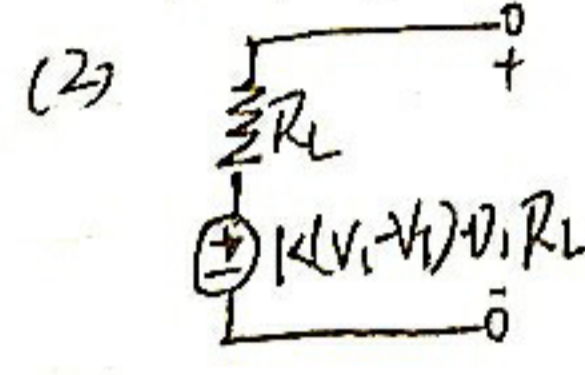$V_0' - V_0 = -\frac{k}{2}(V_1-V_T)^2 R_L.$

(6) $2(V_1-V_T)' = V_1'-V_T.$

$V_1' = 2V_1 - V_T$ $V_0'' - V_0 = -\frac{k}{2}(V_1-V_T)^2 R_L$

V_1 增加 V_1-V_T 对应偏置电压降低 至 $\frac{k}{2}(V_1-V_T)R_L$

练习8.6

(1) 输出端等效电阻为 R_L.

(2)

(3) ∞

问题8.2

(1)

(2) $g_m = \frac{V_1}{ids}$ ≠
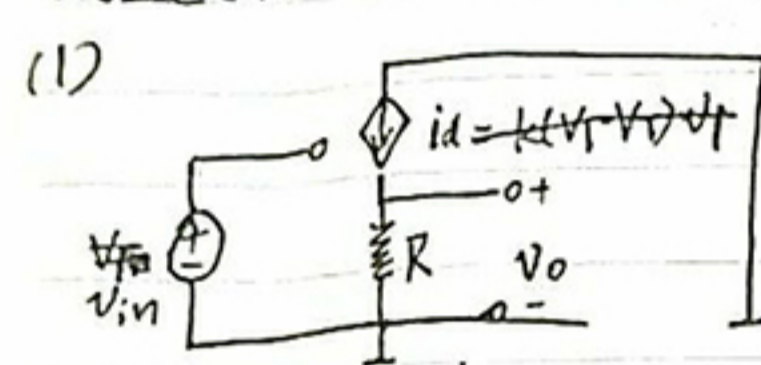
$I_{DS} + ids = \frac{k}{2}(V_{in}-V_{out}-V_T)^2$.

$\frac{k}{2}(V_{in}-V_{out}-V_T)^2 + ids = \frac{k}{2}(V_{in}-V_{out}-V_T)^2 + D K(V_{in}-V_{out}D-V_T)v_{in}+K(V_1)ids$

$ids = K(V_{in}-V_{out}-V_T)v_{in}$

$g_m = \frac{v_{in}}{ids} = K(V_1-V_{out}-V_T)$

(3) $V_{out} = R(ids R = K(V_1-V_{out}-V_T)v_{in}$

$\frac{V_{out}}{V_{in}} = K(V_1-V_{out}-V_T)$

(4) 等效电阻为 R

(5) $V_{out} = \frac{k}{2}(V_1+V_{in}-V_{out}-V_T)R_L$.

$\{ V_1+V_{in}-V_T \geqslant V_{out}$
$V_{in}-V_T \leqslant V_S$

$V_{out} = (V_1+V_{in}-V_T)-\sqrt{(V_1+V_{in}-V_T)/KR_L - 1/K^2R_L^2}$

$R_{输出} = \frac{V_{out}}{v_{out}} = \frac{V_{out}}{K(V_1-V_{out}-V_T)v_{in}}$

解得 $V_1 = V_T = |V|$

(6) $V_{out} = \frac{k}{2}(V_{in}-V_{out}-V_T)^2 R$

$V_{out} = |V|$

$|\frac{V_{out}}{V_{in}}| = g_m R = K(V_{in}-V_{out}-V_T)R = 2$

$R_{输出} = +\Omega |K\Omega$
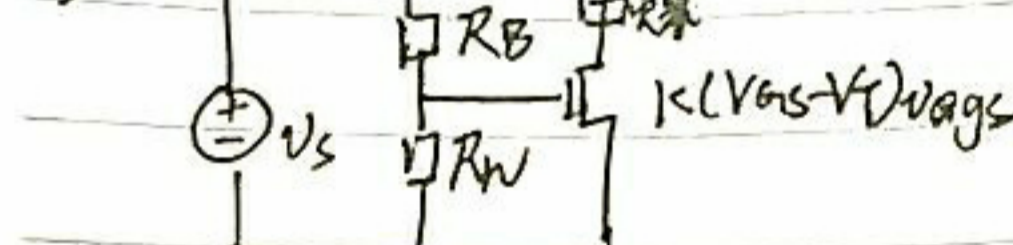
问题8.4.

(1) $V_{GS} = (V_S-V_N)\cdot\frac{R_N}{R_B+R_N} + V_N = \frac{V_S R_N + V_N R_B}{R_B+R_N}$

(2) $I_L = \frac{k}{2}(V_{GS}-V_T)^2$

$I_L = \frac{k}{2}(\frac{V_S R_N + V_N R_B}{R_B+R_N} - V_T)^2$

(3)

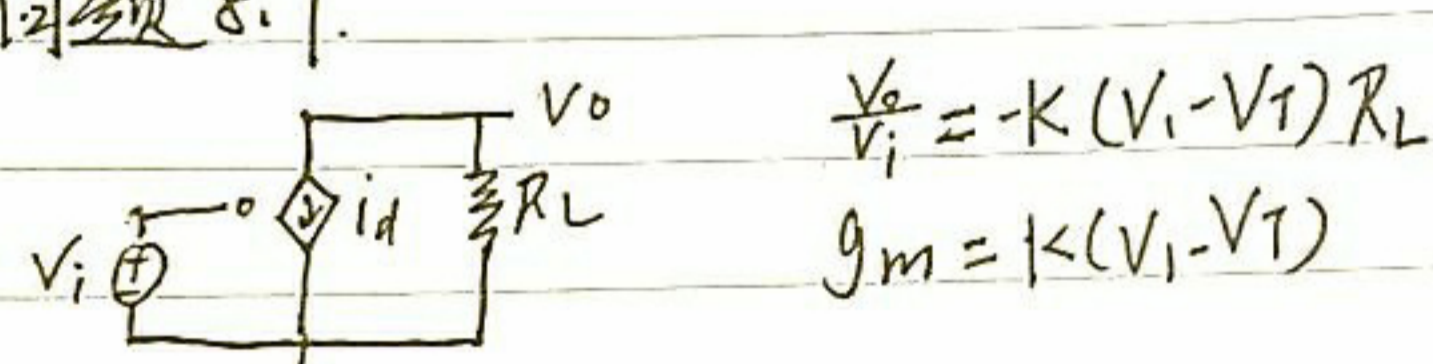$V_{GS} = V_S \cdot \frac{R_N}{R_B+R_N}$

$i_1 = K(\frac{V_S R_N + V_N R_N + V_N R_B}{R_B+R_N}) - V_T) \cdot \frac{V_S R_N}{R_B+R_N}$

(4) $\frac{i_1}{v_S} = K\cdot(-\frac{V_S R_N + V_N R_B}{R_B+R_N} - V_T)\cdot\frac{R_N}{R_B+R_N}$

问题8.7.

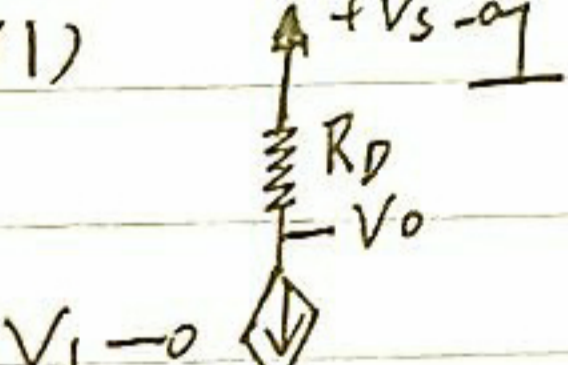$\frac{V_0}{V_1} = -K(V_1-V_T)R_L.$

$g_m = K(V_1-V_T)$

问题8.10.

(1)

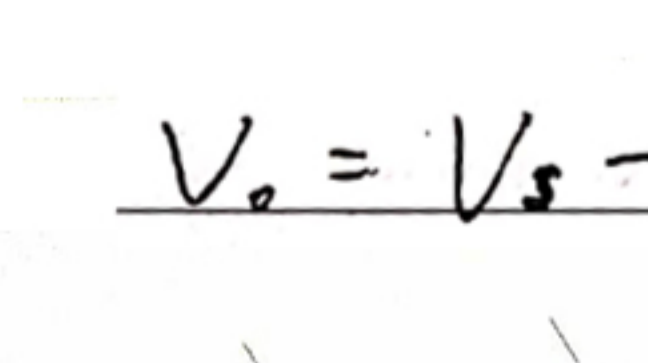

(2) $I_D = \frac{k}{2}(V_1+V_S-I_D R_S-V_T)^2$

$I_D = \frac{-\sqrt{2KR_S(V_1+V_S-V_t)+1}}{KR_S^2} + \frac{kR_S(V_1+V_S-V_t)+1}{?}$

$V_0 = V_S - R_D I_D$

(3)

(4) $g_m = K(V_{GS}-V_T)R_D$

$= K(V_0-V_T)R_D$

(5) $R_{输出} = R_D$

(6) $R_{输入} = \infty$