② $V_{TP} = -1.2\,V$ $\quad W/L = 20$ $\quad k_p' = 30\,\mu A/V_n$

$I_D = 0.5\,mA$. & $V_O = -3V$. $\quad R_S$ & R_D.

$0 = V_{DS} - IR_D - 5$.

$0 = -3 - 0.5R_D - 5$.

$0.5R_D = 7$.

$R_D = 4k\Omega$

$5 = IR_S + V_{DS} + IR_D - 5$.

$7 = 6.5 \times 10^{-3} R_S - 3 + 0.5 \times 10^{-3} R_D - 5$.

$13 = 0.5 \times 10^{-3} R_S + 0.5 \times 10^{-3} R_D$.

$R_D = 4k\Omega$.

$R_S = 6k\Omega$

$I_D = \frac{k_p'}{2}\left(\frac{W}{L}\right)(V_{GS} - V_{TN})^2$

$0.5 \times 10^{-3} = \frac{30 \times 10^{-6}}{2}(20)(V_{GS} + 1.2)^2$.

$1.6 = (V_{GS} + 1.2)^2$.

$1.2 = (V_{GS} + 1.2)$

$V_{GS} = 0$.

④. $V_{DS} = V_{GS}$.

$10 = V_{DS} + I_D R$.

$10 = V_{DS} + I_D \times 10 \times 10^3$

$I_D = \frac{k_n}{2}(V_{GS} - V_{TN})^2$

$I_D = \frac{0.4}{2}[V_{DS} - 2]^2$.

$I_D \simeq 0.62\,mA$.

$V_{DS} = 1.52\,V$.

$10 = V_{DS} + 0.2(V_{DS} - 4V_{DS} + 4)\,10 \times 10^3$

$10 = V_{DS} + 0.2V_{DS} - 0.8V_{DS} + 0.8 \times 10^4$.

$10 = V_{DS} + 2000V_{DS} - 8000V_{DS}$.

$7990 = V_{DS}$

$V_{DS} = 1.33$.