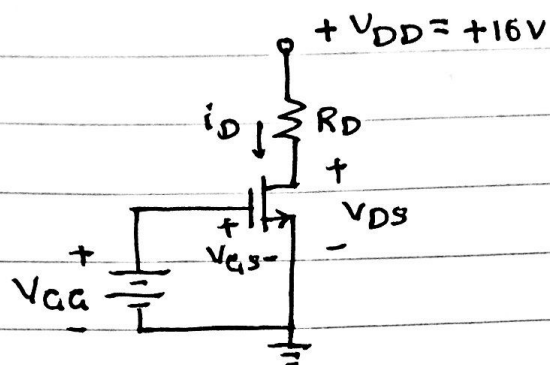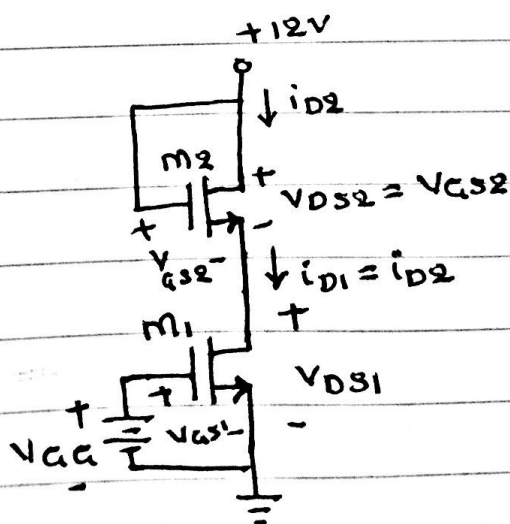Q.1) For the circuit shown in the below figure, Suppose that $R_D = 250\,\Omega$ and the MOSFET has parameters $K = 0.25\ mA/V^2$ and $V_t = 2V$. Find V_{GG} such that $i_D = 4mA$

Q.2) For the circuit shown below, suppose that both enhancement MOSFETs have $K = 0.25 mA/V^2$ and $V_t = 2V$ when $V_{GG} = 6V$, then M_1 operates in the active region. Find $i_{D1}, i_{D2}, V_{DS1},$ and V_{DS2}.

Q.3) For the inverter given below figure, suppose that $V_{GG} = 18V$, $V_{DD} = 12V$, and both MOSFETs have $V_t = 2v$. Given that $K_1 = 0.25 \, mA/v^2$, analytically determine V_o for the case that $V_1 = 12V$ and K_2 is (a) $0.25 \, mA/v^2$ and (b) $0.05 \, mA/v^2$

(m_1 operates in ohmic region)
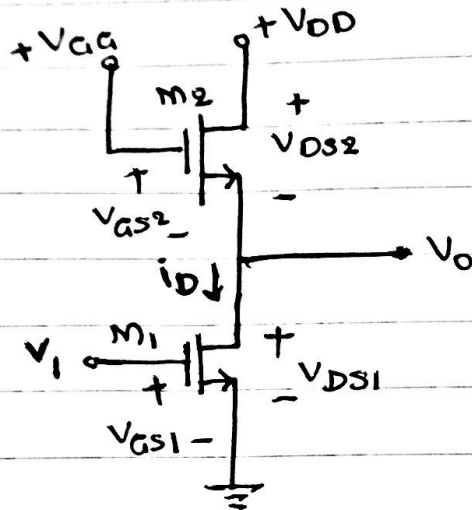
Q.4) For the NMOS NOR gate given below, suppose that $V_{DD} = 12V$, both enhancement MOSFETs have $V_t = 2v$ and $K = 0.25 \, mA/v^2$, and the deplection MOSFET has $I_{DSS} = 4mA$ and $V_P = -4V$. Find V_o when $V_1 = V_2 = 12V$

(m_1 and m_2 are in ohmic region and M_3 is in the active region)