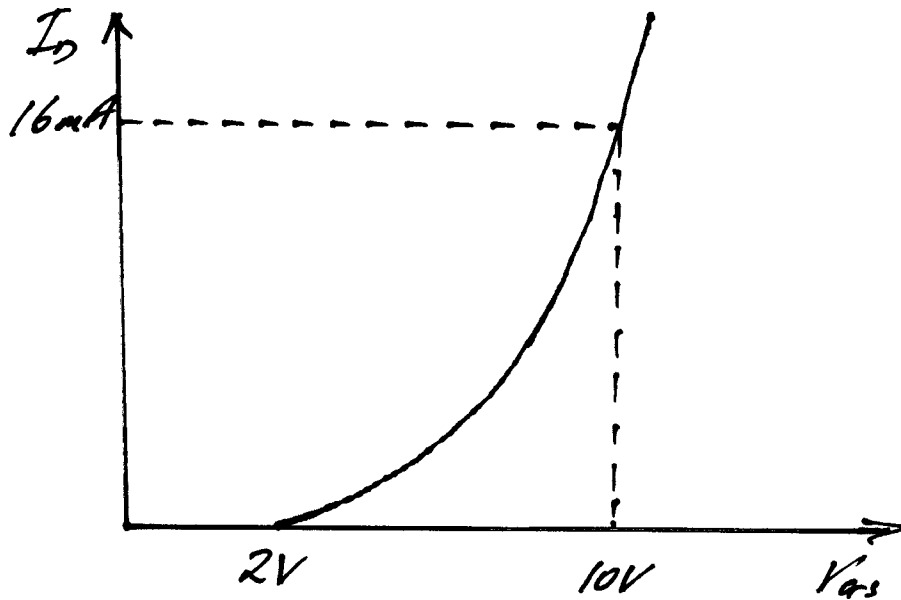


Problem Sheet 3

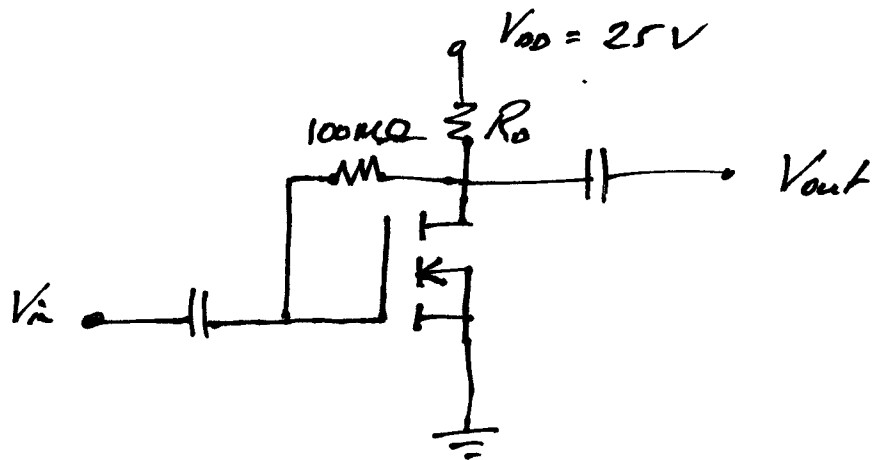
Q1.



For an E-MOSFET with a transconductance curve as shown what is the drain current when $V_{GS} = 5V$?

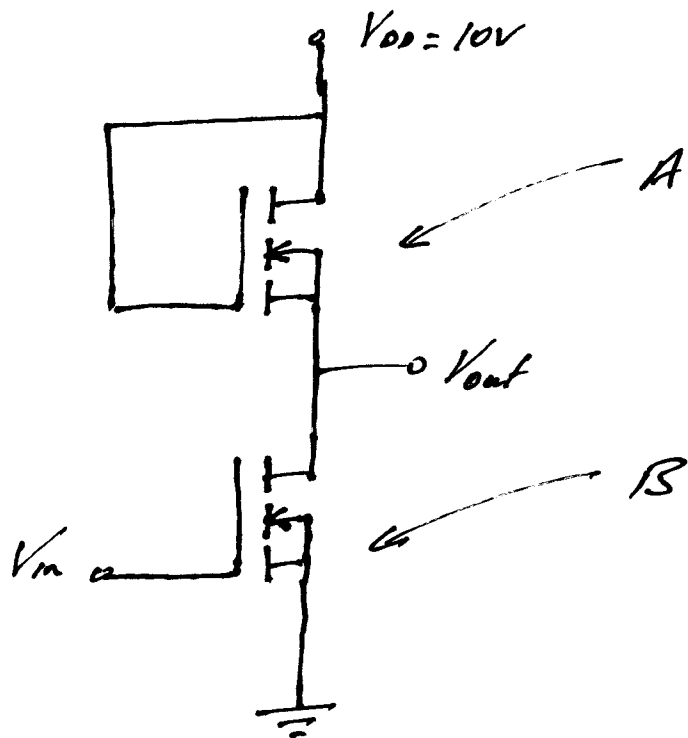
— . —

Q2.



If this MOSFET has a transconductance curve as in Q1. Then if $V_{GS} = 10V$ what does V_{GS} equal? What is the value of R_D ?

Q3.



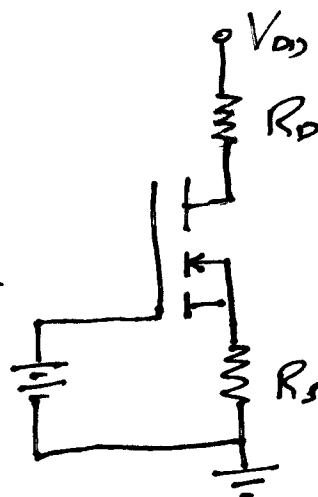
The upper MOSFET 'A' has an 'ON' resistance ($R_{DS(on)}$) of $2k\Omega$. When $V_{in} = +3V$ the lower MOSFET 'B' has $R_{DS(on)} = 150\Omega$.

What is the output voltage when $V_{in} = 0$?

When $V_{in} = +3V$?

Q4.

For the circuit shown $K = 0.15mA/V^2$, $V_{GS(on)} = 2V$, and operates in the V_{GS} active region. Suppose $V_{DD} = 12V$.



(i) Find V_{GS} when $R_S = 0\Omega$ and $I_D = 5.4mA$

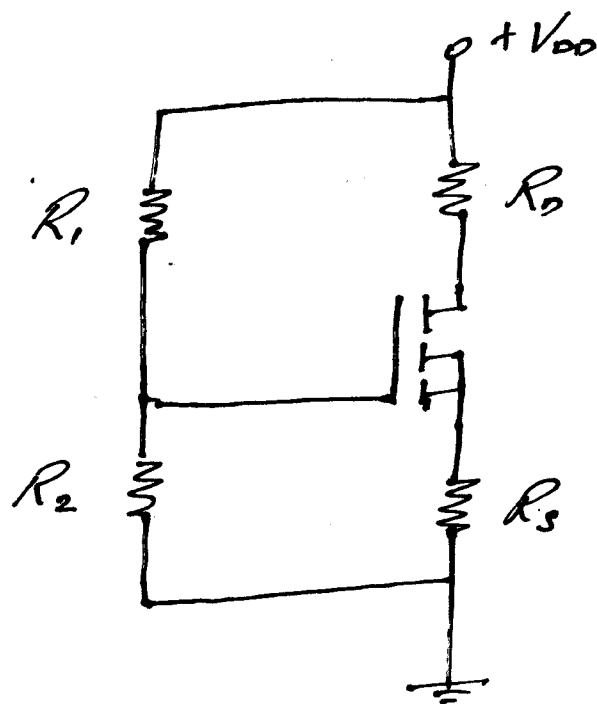
(ii) Find I_D when $V_{GS} = 4V$

(iii) find V_{GS} when $I_D = 2.4 \text{ mA}$

(iv) find R_S when $V_{GS} = 3 \text{ V}$ and $V_{GG} = 4.5 \text{ V}$

(v) find R_D when $V_{GS} = 3 \text{ V}$, $V_{DS} = 7.5 \text{ V}$ and $V_{GG} = 4.5 \text{ V}$.

Q5.



For the above circuit $k = 0.25 \text{ mA/V}^2$ and $V_{GS(TH)} = 1 \text{ V}$.
Given that $R_1 = 300 \text{ k}\Omega$, $R_2 = 100 \text{ k}\Omega$ and $R_D = R_S = R$,
 $V_{DD} = 12 \text{ V}$ and $V_{DS} = 10 \text{ V}$, find:

- (i) V_{GS}
- (ii) I_D
- (iii) R