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Q1
D C B D A

Q2
(1)
Based on the majority charge carriers, the MOSFETs can be divided into NMOS and PMOS. NMOS use N-type material and PMOS use P-type material as channel.

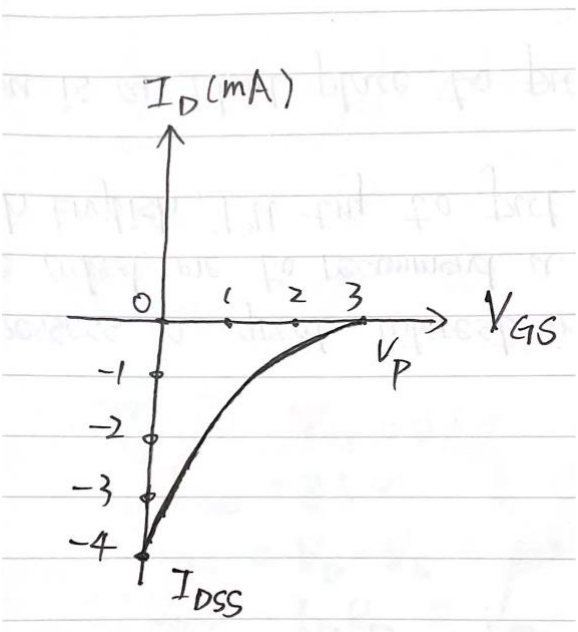
The characteristics of NMOS, Vgs greater than a certain value will be turned on, suitable for the source grounding situation (low-end drive). The characteristics of PMOS, Vgs less than a certain value will be turned on, suitable for the source of VCC (high-end drive).

(2)
Pinch off regions (when VGS>VT): there is no current through the c

Linear Region (when 0 < VDS < VGS – VT): Its properties are similar to Ohm's law. The current is approximatively linearly dependent on VDS.

Saturation region(When VDS > VGS – VT): no more current should ideally flow. In practice, the current will approximate a steady constant current.

Q3



Q4

Q4. Sol.

$I_D = k(V_{GS} - V_{GS(th)})^2$. ①

$I_D = 3mA \quad V_{GS} = 4V \quad V_{GS(th)} = 2V$

So $k = 7.5 \times 10^{-4}$

$V_G = 10V \cdot \frac{47}{147} \approx 3.2V$

$\therefore V_{GS1} = 3.2V$ ②

$I_{D1} = k(V_{GS1} - V_{GS(th)})^2$ ③

$\therefore I_{D1} = 1.1mA$

$\because V_{DD} - I_{D1}R_D = V_{D1}$ ④

$\therefore V_{D1} = 8.9V$

$V_{DS} = V_{D1} - V_S$ ⑤

So $\begin{cases} V_{GS} = 3.2V \\ V_{DS} = 8.9V \end{cases}$

Q5

Q5. Sol

$V_S = 0 \quad V_G = 8.5V$ ①

$\therefore V_{GS} = 8.5V \quad V_D = 8.5V$ ②

$\therefore V_{DS} = V_D - V_S = 8.5V$

$\because V_{DD} - I_D R_D = V_D$

$\therefore I_D = 1.4mA$

So $V_{DS} = 8.5V$

$I_D = 1.4mA$