

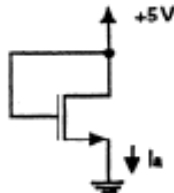


EC332: Electronic Devices (2).

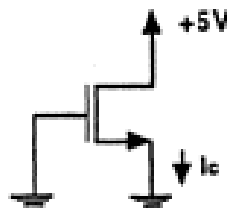
SHEET (3)

- 1- A p-Channel MOSFET for which $|V_t| = 2\text{ V}$ has a channel width of $100\ \mu\text{m}$ an length of $3\ \mu\text{m}$. If it is fabricated in a process for which $\mu_n C_{ox} = 20\ \mu\text{A}/\text{V}^2$ and $\mu_p C_{ox} = 0.01\ \text{V}^{-1}$, estimate the drain current for saturation operation with $V_{GS} = V_{DS} = -5\ \text{V}$. [Use $\mu_n = 2.5\ \mu_p$].
- 2- For the following circuits , employing enhancement MOSFETs, for Which $|V_t| = 2\ \text{V}$ and $\mu_n C_{ox} = 20\ \mu\text{A}/\text{V}^2$, $W = 20\ \mu\text{m}$, $L = 2\ \mu\text{m}$, Find the labeled currents and voltages. . [Use $\mu_n = 2.5\ \mu_p$].

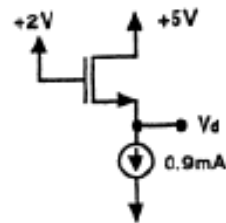
a-



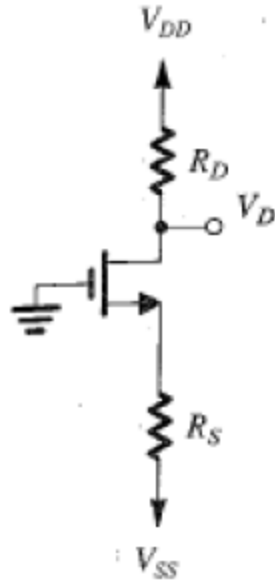
b-



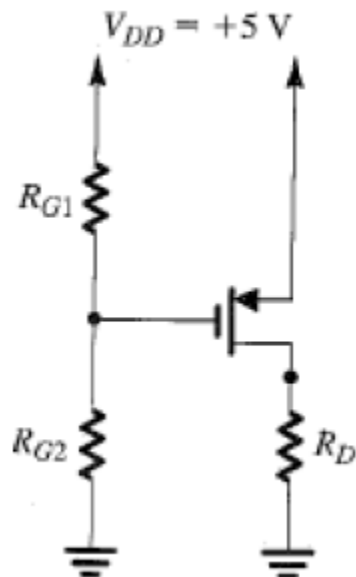
c-



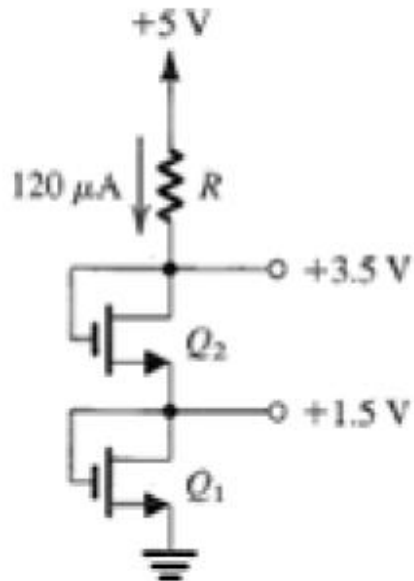
- 3- For the following circuit shown in figure employing n-channel enhancement transistor for which $V_t = 1\text{ V}$, $\mu_n C_{ox} = 20\ \mu\text{A}/\text{V}^2$ and $W = 40\ \text{L}$, and with $R_D = 7.5\ \text{K}\Omega$, $V_{SS} = -5\ \text{V}$ and $V_{DD} = 5\ \text{V}$, V_D measured to be 2 V . (hint: Neglect channel length modulation effect)
 - a- What is the value of the drain current.
 - b- What source voltage would be expected
 - c- What is the value of R_S used.



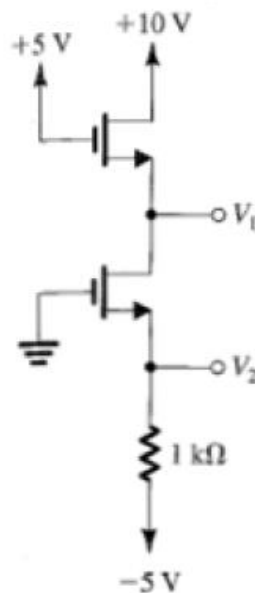
- 4- Design the circuit shown in the figure so that the transistor operate in saturation with $I_D = 0.5 \text{ mA}$ and $V_D = 3 \text{ V}$. Let the enhancement type PMOS transistor have $V_t = -1 \text{ V}$ and $K'_P \frac{W}{L} = 1 \text{ mA/V}^2$. What is the largest value of R_D can have while maintaining saturation. (hint: neglect channel length modulation effect)



- 5- The N-MOS transistors in the figure have $V_t = 1V$, $\mu_n C_{ox} = 120 \mu A/V^2$ and $L_1 = L_2 = 1 \mu m$. Find the required values of W for each transistor and value of R to obtain the voltage and current values indicated. Assume $\lambda = 0$



- 6- For the following circuit shown in figure find the labeled node voltages. The NMOS transistor have threshold voltage = 1 V and $K'_n \frac{W}{L} = 2 mA/V^2$. Assume $\lambda = 0$.



Good Luck ☺