



Sheet(3): MOSFET DC Analysis

- 1- For the circuits shown on Figure 1 find the value of R_S and R_D . If

$$I_D = 0.4 \text{ mA and } V_D = +0.5 \text{ V.}$$

$$V_t = 0.7 \text{ V, } \mu_n C_{ox} = 100 \mu\text{A/V}^2, L = 1 \mu\text{m, and } W = 32 \mu\text{m.}$$

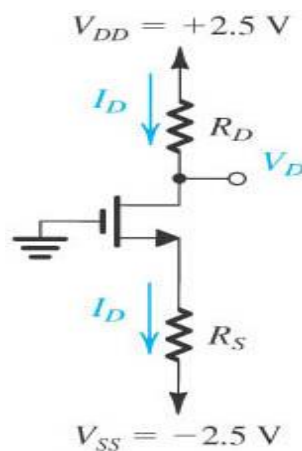


Fig 1

- 2- Sketch the dc load line and plot the Q Point for problem 1.

- 3- For the circuits shown on Figure 2 find the value of R . If

$$I_D \text{ of } 80 \mu\text{A } V_t = 0.6 \text{ V, } \mu_n C_{ox} = 200 \mu\text{A/V}^2.$$

$$L = 0.8 \mu\text{m, and } W = 4 \mu\text{m}$$

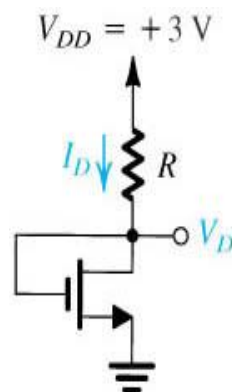


Fig 2

- 4- Sketch the dc load line and plot the Q Point for problem 3.
- 5- For the circuits shown on Figure 3 find all the node voltages and branch currents.

Let $V_t = 1 \text{ V}$ and $k'_n(W/L) = 1 \text{ mA/V}^2$.

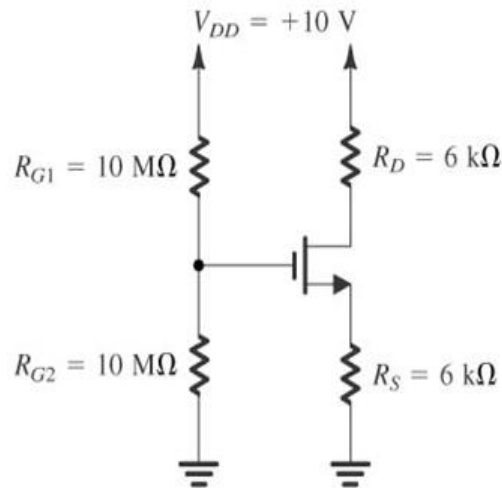


Fig 3

- 6- Sketch the dc load line and plot the Q Point for problem 5.
- 7- Design the circuit that shown on Figure 4 to make the transistor in sat. If $K_p(w_p/L_p) = 1 \text{ mA/V}^2$ and $V_t = -1 \text{ V}$.

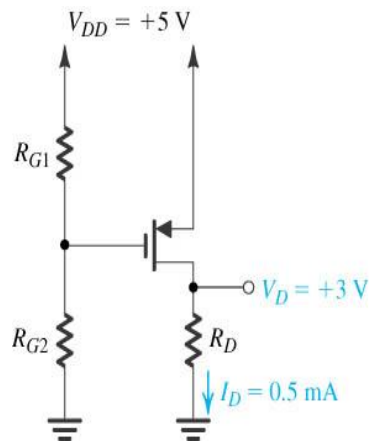


Fig 4

- 8- Sketch the dc load line and plot the Q Point for problem 7.

- 9- Design the circuit (find R_D and I_D) that shown on Figure 5. If $V_t = -1\text{ V}$ and $k_p'(W/L) = 1\text{ mA/V}^2$.

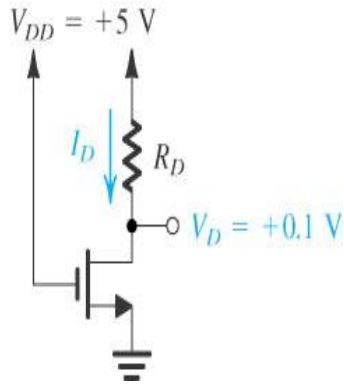


Fig 5

- 10-Sketch the dc load line and plot the Q Point for problem 9.

- 11-The NMOS and PMOS transistor shown in figure 6 in the circuit are matched with $K_n(w_n/L_n) = K_p(w_p/L_p) = 1\text{ mA/V}^2$ and $V_{tn} = -V_{tp} = 1\text{ v}$ find I_{Dn} , I_{Dp} as well as V_o for $V_i = 0\text{V}$, 2.5V and -2.5V .

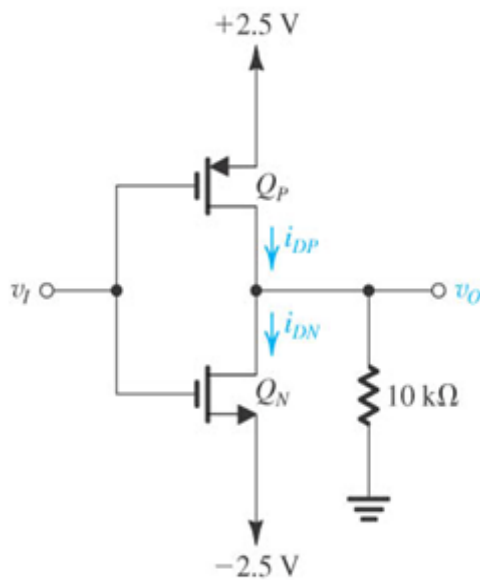


Fig 6

- 12-Sketch the dc load line and plot the Q Point for problem 11.

13-Design the circuit that shown on Figure 7 to make $I_D = 0.5\text{mA}$ for $K_n(w_n/L_n) = 1\text{mA/V}^2$ and $V_t = 1\text{V}$. If another MOSFET is replaced having $K_n(w_n/L_n) = 1\text{mA/V}^2$ and $V_t = 1.5\text{V}$.

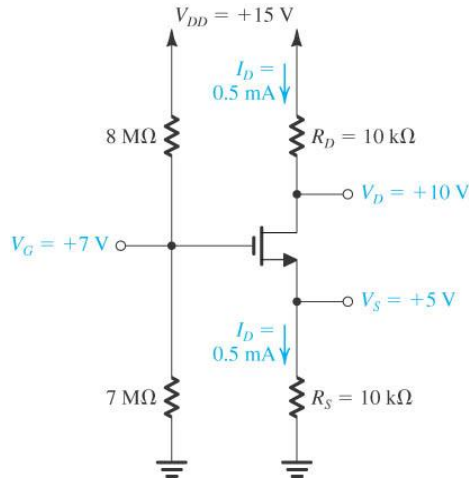


Fig 7

14-Sketch the dc load line and plot the Q Point for problem 13.

15-For the circuits shown on Figure 8 find all the node voltages and branch currents If $K_n(w_n/L_n) = 1\text{mA/V}^2$ and $V_t = 1.5\text{V}$.

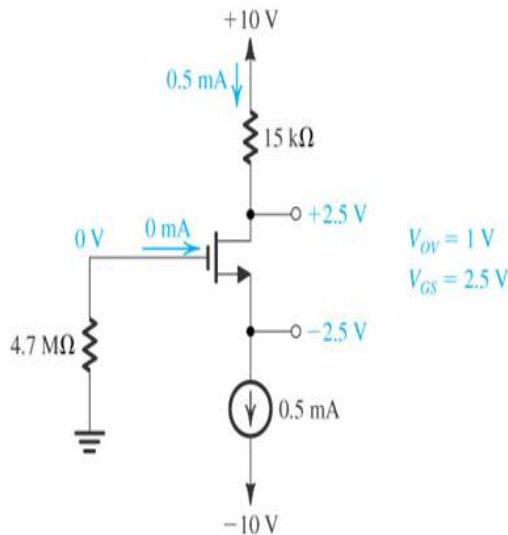


Fig 8

16-Sketch the dc load line and plot the Q Point for problem 15.

17-Design the circuit shown on figure 9 (find R_D and R_S), such that $I_D=0.5$ mA, and $V_D =1V$. The parameters for the transistor are $K_n = 0.25$ mA/V² and $V_{TN} = 1.4V$.

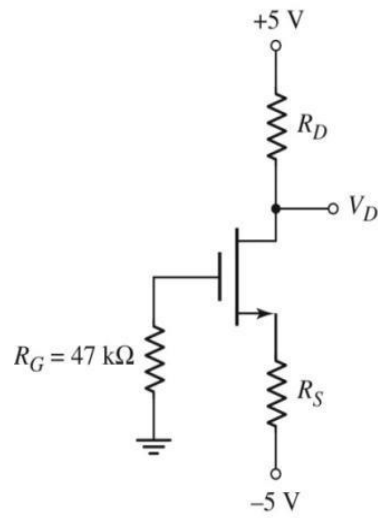


Fig 9

18-Sketch the dc load line and plot the Q Point for problem 17.