Sheet (4)
MOSFET

Problem (1)

Indicate whether each of the following statements is true or false

1. The current direction in NMOS transistor is from source to drain.

2. MOSFET transistor is a device in which lateral current is controlled by vertical electric field.

3. Channel in NMOS is created due to capacitance effect of the transistor gate.

4. MOSFET can be used as a voltage-controlled-resistor (VCR) at small VDS.

5. For ideal MOSFET, the resistance between drain and source is infinite at triode region.

Problem (2)

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

$I_D = 0.4$ mA and $V_D = +0.5$ V.

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

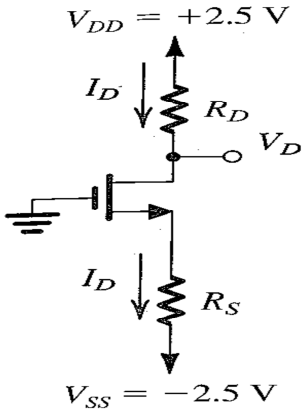

Fig 1

Problem (3)

For the circuits shown on Figure 1 find the value of R. If
I_D of 80 μA V_t = 0.6 V, $\mu_n C_{ox}$ = 200 μA/V^2.
L = 0.8 μm, and W = 4 μm

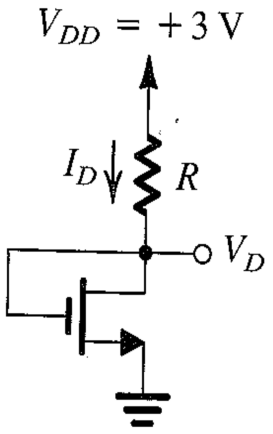

Fig 2

Problem (4)

For the circuits shown on Figure 3 find all the node voltages and branch currents.
Let V_t = 1 V and $k_n'(W/L)$ = 1 mA/V^2.
What happen if?

a- R_D=14.
b- R_s=10.

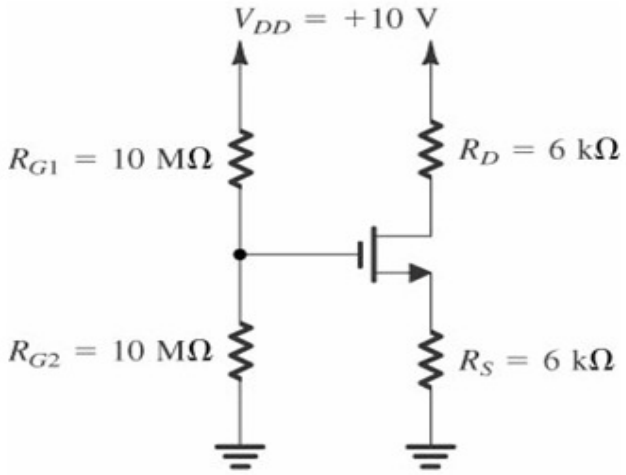

Fig 3

Problem (5)

For the circuits shown on Figure 4 find the value of R_{G1} and R_{G2} to make the transistor in sat. **If**

$V_t = -1$ V and $k_p'(W/L) = 1$ mA/V^2.

Solve it with the graphical solution, if we know R_{G1} and R_{G2} .

What is the largest value of R_D to make the transistor in sat.

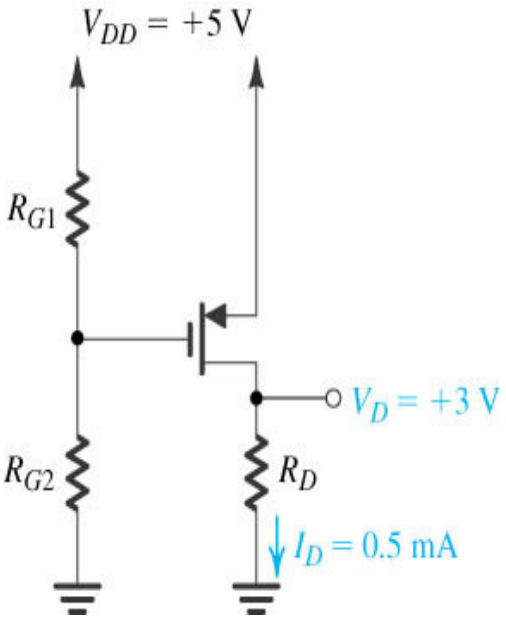

Fig 4