COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electronics and Communications Engineering

Course Title: Electronic Devices I I

Course Code: EC332

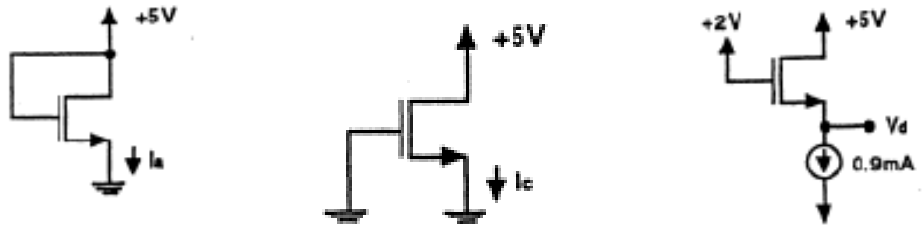
Cairo Branch

Sheet 3

P1- A p-Channel MOSFET for which $|V_t| = 2\ V$ has a channel width of 100 μm an length of 3 μm. If it is fabricated in a process for which $\mu_n C_{ox} = 20\ \mu A/V^2$ and $= 0.01\ V^{-1}$, estimate the drain current for saturation operation with $V_{GS} = V_{DS} = -5\ V$. [Use $\mu_n = 2.5\ \mu_p$].

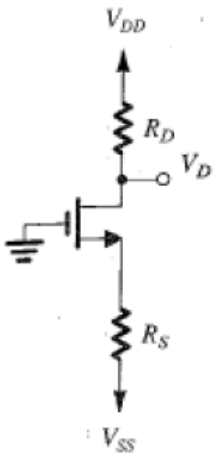
P2- For the following circuits , employing enhancement MOSFETs, for Which $|V_t| = 2\ V$ and $\mu_n C_{ox} = 20\ \mu A/V^2$, W= 20 μm , L = 2 μm. Find the labeled currents and voltages. [Use $\mu_n = 2.5\ \mu_p$].

a- b- c-

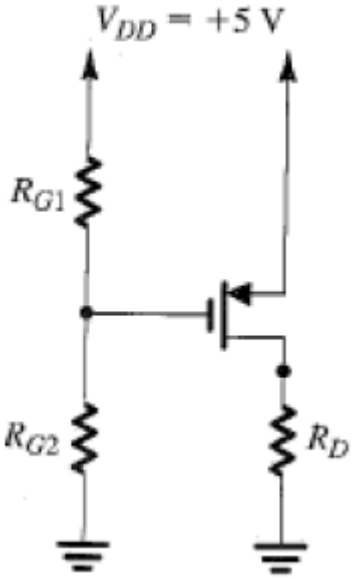


P3- For the following circuit shown in figure employing n-channel enhancement transistor for which V_t = 1V , $\mu_n C_{ox} = 20\ \mu A/V^2$ and W = 40 L , and with $R_D = 7.5\ K\Omega$, $V_{SS} = -5\ V$ and $V_{DD} = 5\ V$, V_D measured to be 2V. Neglect channel length modulation effect.

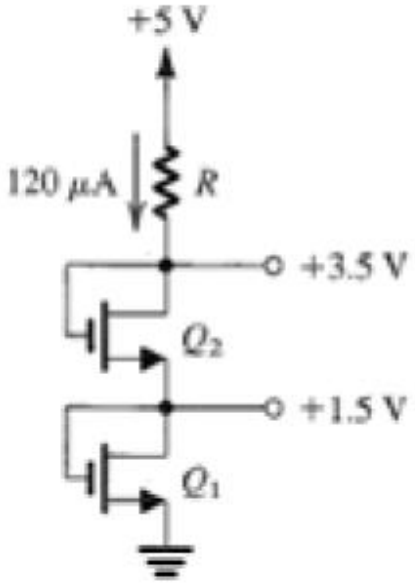
a- What is the value of the drain current?
b- What source votlage would be expected?
c- What is the value of R_S used?



P4- Design the circuit shown in the figure so that the transistor operate in saturation with $I_D = 0.5\ mA$ and $V_D = 3\ V$. Let the enhancement type PMOS transistor have $V_t = -1V$ and $K'_P \frac{W}{L} = 1\ mA/V^2$. What is the largest value of R_D can have while maintaining saturation. Hint: neglect channel length modulation effect.



P5- The N-MOS transistors in the figure have $V_t = 1V$, $\mu_n C_{ox} = 120\ \mu A/V^2$ and L1 = L2 = $1\mu m$. Find the required values of W for each transistor and value of R to obtain the voltage and current values indicated. Assume $\lambda = 0$.



P6- 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 $\lambda = 0$.