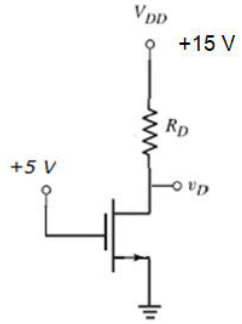
19EEE114 Electronic Circuits

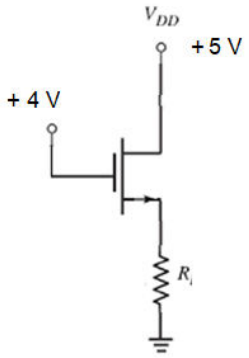
Assignment #5

Due on: 01st June 2022

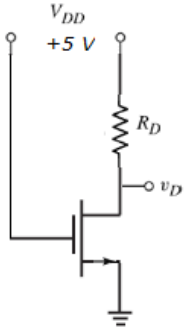
Q1. For the circuit shown, find i_D and v_{DS}. For the NMOS, V_t = 1 V and Kn = 0.5 mA/V^2. Consider R_D = 1 kΩ



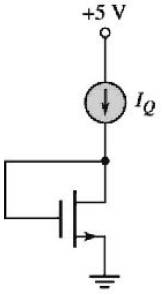
Q2. Design the circuit so that i_D = 1 mA and v_{DS} = 2.5 V. The NMOS has V_t = 1 V. Find k_n.



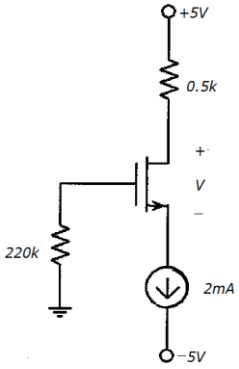
Q3. Design the circuit to establish a drain voltage of 0.2 V. What is the effective operating resistance between drain and source at this Q-point? Take V_t = 1 V and k(W/L) = 2mA/V^2.



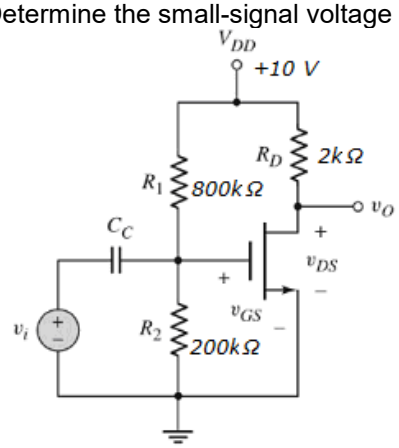
Q4. The parameters for the transistor below are kn = 0.5 mA/V^2, W/L=1, Vtn = 1.2 V, and λ = 0. Determine V_{DS} and V_{GS} for I_D = 1 mA.



Q5. The N-channel enhancement mode MOSFET in this circuit has the following parameters: Kn'(W/L) = 2mA/V^2, V_{tn}=1V, and λ = 0. Determine the voltage V as shown.



Q6. The n-channel MOSFET in this circuit has Kn'(W/L) = 2mA/V2 and V_{tn}=1V. Neglect λ.
a) Determine the dc operating point.
b) Draw the small signal model for the circuit.
c) Determine the small-signal voltage gain.



Q7. The parameters of the circuit shown below are V_{DD} = 5 V, R_1 = 520 kΩ, R_2 = 320 kΩ, R_D = 10 kΩ, and R_{Sig} = 0. Assume transistor parameters V_{tn} = 0.8V, Kn = 0.20 mA/V^2, and λ= 0.
(a) Determine the small-signal parameters g_m and r_o.
(b) Find the small-signal voltage gain v_o/v_i.