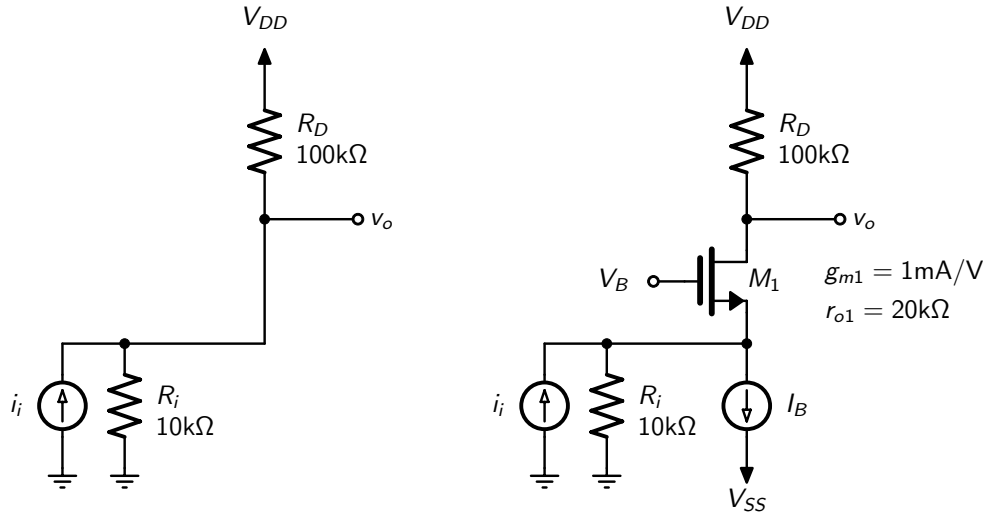
Problem Set 3B - MultiStage

Question 1

It is desired to create a voltage output from a small current source input (say from a photodetector). The maximum current source amplitude is 10μA. The figure below shows 2 circuits. Circuit (a) does not make use of a transistor while circuit (b) makes use of one transistor. R_i is the output impedance of the current source and i_i is the input current source. V_B is a dc bias voltage. Also, assume the current source I_B is ideal.



(a) (b)

Use small-signal analysis to answer the following

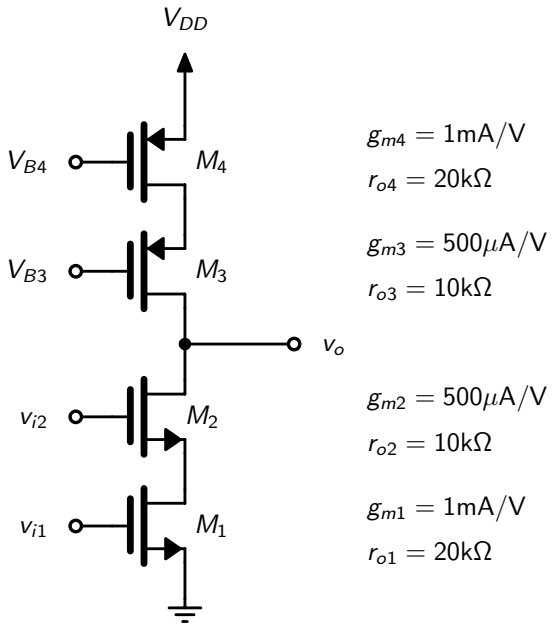
(a) Find the maximum $v_{o,max}$ for circuit (a)

(b) Find the maximum $v_{o,max}$ for circuit (b)

Answer

(a) $v_{o,max} = 90.91\text{mV}$ (b) $v_{o,max} = 0.6364\text{V}$

Question 2



For the circuit above

(a) Find v_o/v_{i1} assuming v_{i2} is a dc bias voltage.

(b) Find v_o/v_{i2} assuming v_{i1} is a dc bias voltage.

Answer

(a) $v_o/v_{i1} = -60\text{V/V}$ (b) $v_o/v_{i2} = -2.5\text{V/V}$