In the Name of God

K.N. Toosi University of Technology

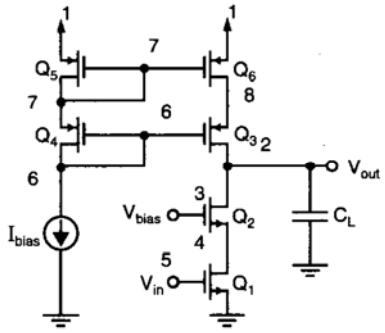
Electrical Faculty

Analog Electronics II

Spring 2017

Project#1 (Cascode Amplifier Design)

Making use of both ADS and 0.18µm CMOS technology, simulate the following circuit.



	W(µm)	L(µm)
M1, M2	4	0.18
M3, M6	45	0.18
M4, M5	30	0.18

$V_{dd} = 1.8V$, $I_{bias} = 100\,\mu A$, $V_{bias} = 0.9V$ $C_L = 5\,pF$

- In order to set the dc voltage of the output of the amplifier to 0.9 V, find a proper dc voltage for the input signal.
- Why is $V_{out}(dc)$ too much sensitive to $V_{in}(dc)$?
- Making use of "DC Simulation", report the following parameters for each transistor.
  I_D, g_m, V_{DS}, V_{GS}, V_{Dsat}, V_{th}, r_{ds}, C_{gs}, C_{gd}, C_{db}, C_{sb}
- Making use of "Transient Simulation", find the amplitude of the input sinusoidal signal so that $V_o(ac) = 0.1\sin(2\pi f_{in} t), f_{in} = 10\,kHz$.
- What is the voltage gain of the amplifier at $f_{in} = 10\,kHz$?
- Making use of "AC Simulation", plot the amplitude frequency response of the amplifier and determine the following parameters.
  - A_0 (dc voltage gain of the amplifier)
  - $A(f = 10\,kHz)$ (voltage gain of the amplifier at $f_{in} = 10\,kHz$)
  - f_{p1} (-3 dB cut-off frequency)
  - f_T (unity gain frequency)
- Is the following relation is correct?

  $f_T = A_0 \times f_{p1}$
- Conclude about the capabilities of "DC Simulation", "Transient Simulation", and "AC Simulation".