

ENEE 302 Homework Set 4 Due Tu 03/08/05

For CMOS transistors in these problems use the mnmosis and mpmosis transistors with (unless otherwise specified) $L=W=10\mu$, $V_{dd}=5V=-V_{ss}$. For npn transistors use the BN2X8 mosis transistor.

#1. 100 points (design and test of an ECL MUX)

The following circuit is supposedly an ECL multiplexer. In the first instance use $I_T=4.3\text{mA}$ and $R_L=330\Omega$ and then adjust if you think you can get better results.

a) Design the current sources using BN2X8 transistors as two current mirrors fed by the current source portion designed for 4.3mA.

b) Using these current sources set up this ECL MUX in Spice. Use DC voltage sources for the voltages of A, B, and Clk [note that the clock has upper voltage 0v and lower voltage -5v]. Do a DC analysis sweeping the voltage at A while nesting B and taking the clock as a parameter and monitoring V_o and its complement. Submit important figures and curves.

c) In this portion use DC sources for the voltages at A and B and VPULSE for the clock. Then do a transient analysis with three different clock rates, 10MHz, 1GHz and 100GHz with the voltage at A a parameter. Submit the resultant output versus time curves.

d) Discuss the results, especially the circuit's principle of operation, input and output ranges, and operation as a suitable multiplexer.

