EE382M-7 VLSI-I Spring 2009 (Prof. David Pan)

Homework #2: Assigned Feb. 3, due Feb 10

1. Realize the following functions using CMOS technology with the minimum possible number of **transistors** (' is used to denote complementation).

(a) $F = (((a + b) \cdot c) + d)'$

(b) F = (a + b).(a + c)

(c) F = a.b + a'.c + b.c.d

- (d) F = ((a + b + c).d.e)'
- 2. Problem 2.4 from the Exercises for Chapter 2.
- 3. Problem 2.10 from the Exercises for Chapter 2.
- 4. Problem 2.14 from the Exercises for Chapter 2.
- 5. Problem 2.21 from the Exercises for Chapter 2.
- 6. Problem 2.22 from the Exercises for Chapter 2.
- 7. This problem relates to the design of priority functions in CMOS. The 4-input priority function is described below:



- (a) Design a gate-level implementation of the 4-input priority function.
- (b) Design the transistor level implementation of the above function.

The above implementation cannot be readily expanded in a natural way to implement a function with more inputs.

Another solution to the realization of the priority function for N inputs would be to repeat a single variable cell N times. Appropriate information is transmitted between cells as shown in the figure below:



(c) Design a cell in CMOS technology at the transistor level which, when repeated as above, implements the priority function.