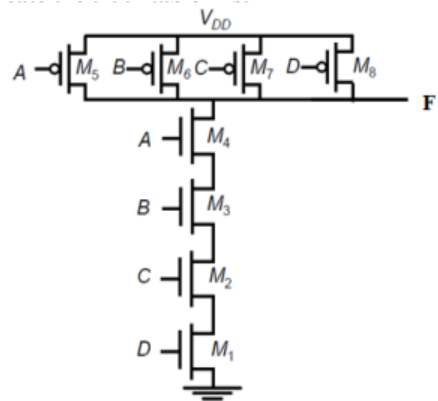


ESE 461: Design Automation for Integrated Circuit Systems

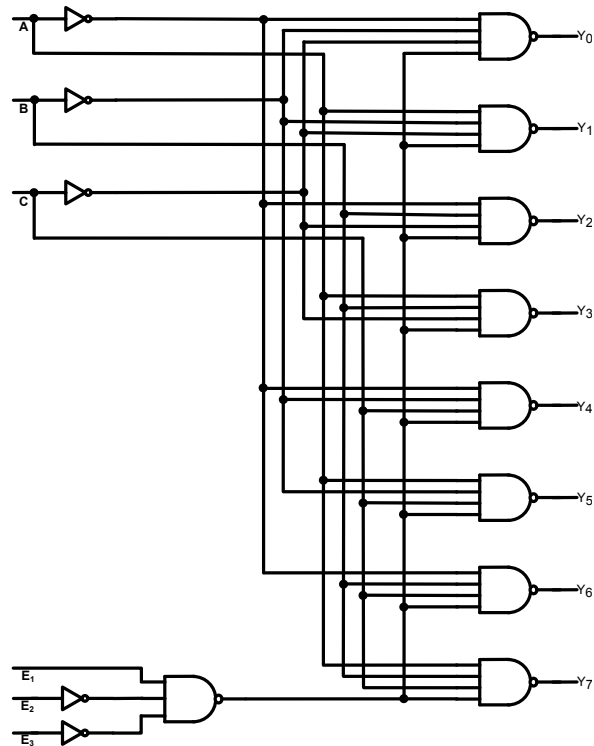
Homework 1

Due: Sep 7, 2:30 pm

1. Describe which logic function the following CMOS transistors execute, $F=(A,B,C,D)$. And create its truth table.



2. The logic diagram for a 74HC138 MSI CMOS circuit is given in the following figure. Find the Boolean function of each output. Describe the circuit function carefully.



3 Design a circuit to implement the following pair of Boolean equations:

$$F = A(C\bar{E} + DE) + \bar{A}D$$

$$G = A(C\bar{E} + DE) + \bar{B}C$$

To simplify drawing the schematic, the circuit is to use a hierarchy based on the factoring shown in the equation. Three instances (copies) of a single hierarchical circuit component made up of two AND gates, an OR gate, and an inverter are to be used. Draw the logic diagram for the hierarchical component and for the overall circuit diagram using a symbol for the hierarchical component.

4. Design a combinational circuit that accept a 3-bit number and generates a 6-bit binary number output equal to the square of the input number.

5. Write the Boolean expression in POS form for the truth table to the right. Complete the Karnaugh Map and simplify the Boolean expression.

		BC			
		00	01	11	10
A	0				
	1				

A	B	C	Y
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

6. Read about how Espresso heuristic logic minimizer works. Describe in your own words.