

CSE 369 QUIZ 1

Name: _____

Student ID
Number: _____

Please do not turn the page until 12:30.

Instructions

- This quiz contains 3 pages, including this cover page. You may use the backs of the pages for scratch work.
- Please clearly indicate (box, circle) your final answer.
- The quiz is closed book and closed notes.
- Please silence and put away all cell phones and other mobile or noise-making devices.
- Remove all hats, headphones, and watches.
- You have 20 (+5) minutes to complete this quiz.

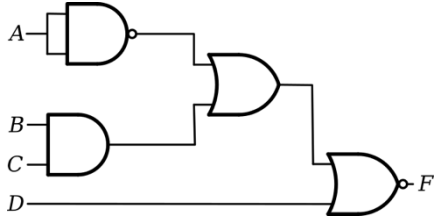
Advice

- Read questions carefully before starting. Read *all* questions first and start where you feel the most confident to maximize the use of your time.
- There may be partial credit for incomplete answers; please show your work.
- Relax. You are here to learn.

Question	Points	Score
(1) CL Gates	8	
(2) K-map	5	
(3) Waveforms & Verilog	13	
Total:	26	

Question 1: Combinational Logic Gates [8 pts]

- (A) Write out a Boolean expression for the circuit diagram below. *No need to simplify.* Remember to use + (OR), · (AND), and $\bar{}$ (NOT) as well as any necessary parentheses to make your answer unambiguous. [2 pts]



- (B) Find a minimal implementation of the function below using only **2-input NOR gates**. *We will only accept circuit diagrams.* [6 pts]

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

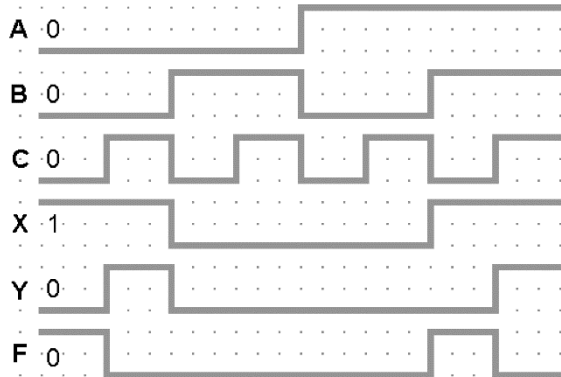
Question 2: Karnaugh Maps [5 pts]

Find the *minimum sum-of-products solution* for the K-map shown below.

		A					
		—	—	—	—		
C		1	X	0	X		D
		0	1	1	0		
		0	0	1	0		
		X	0	X	1		
		B					
		—	—	—	—		

Question 3: Waveforms & Verilog [13 pts]

- (A) Consider the Verilog simulated testbench waveforms shown. Assume all delays are set to 0. If we know that X and Y are outputs of 2-input logic gates, complete the module `Mystery` below. [7 pts]



```

module Mystery (F, A, B, C);
output logic F;
input logic A, B, C;
logic X, Y;

_____;

_____;

xor G3 (F, X, Y);
endmodule

```

- (B) A testbench for the `Mystery` module (with inputs A, B, C) is shown below. Which input combinations are NOT currently being tested? You may not need all of the blanks. [3 pts]

```

module Mystery_testbench ();
logic F, A, B, C;

initial begin

    A = 0; B = 0; C = 0; #10;
    A = 1;          #10;
        B = 1;      #10;
            C = 1;  #10;
    A = 0; B = 0;   #10;
        B = 1; C = 0; #10;
            B = 0;   #10;
    A = 1;          #10;

end
endmodule

```

Missing combinations:

1. {A,B,C} = 3'b____;
2. {A,B,C} = 3'b____;
3. {A,B,C} = 3'b____;
4. {A,B,C} = 3'b____;

- (C) Circle the value of A at the beginning of the simulation of `Mystery_testbench`: [1 pt]

0 1 X Z

- (D) Give a brief piece of advice on how to improve the above testbench. [2 pts]