CSE 369 QUIZ 1

Name: _____

UWNetID: _____

Please do not turn the page until 10:30.

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 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	11	
Total:	**24**	

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), $\cdot$ (AND), and $^-$ (NOT) as well as any necessary parentheses
to make your answer unambiguous. [2 pts]
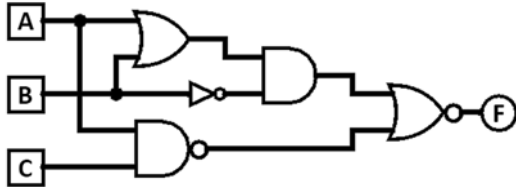
(B) Find a minimal implementation of the function below using only **2-input NAND
gates**. *We will only accept circuit diagrams.* [6 pts]
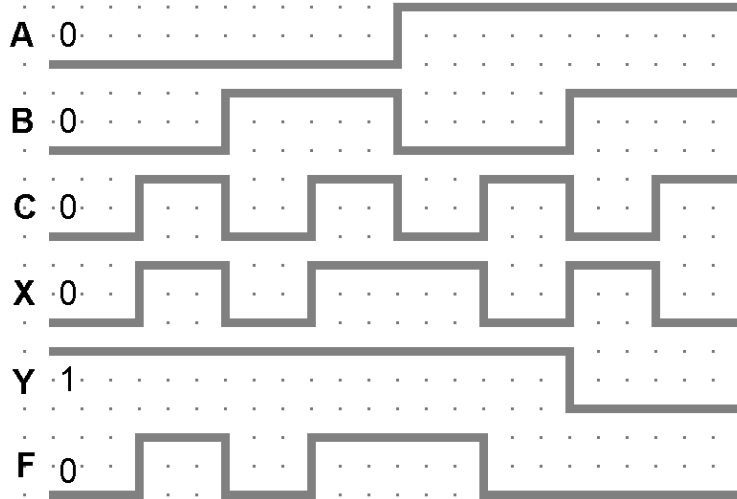
$$F = \bar{A} + B + CD$$

Question 2: Karnaugh Maps [5 pts]

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

Question 3: Waveforms & Verilog [11 pts]

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

A 0

B 0

C 0

X 0

Y 1

F 0

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

     _____

     _____

     and G3 (F, X, Y);
endmodule
```

(B)   Our DE1-SoC is broken and we only have the 1- or 2-input logic gates shown at right available to us. Given the logic delays shown, draw out the circuit diagram of the *fastest* implementation of the Verilog statement below. [4 pts]

NOT	OR	NOR
5 ns	30 ns	20 ns

Hint: How many inputs are there? How many gates do you think you'll need?

```
assign F = ~((~A | B) & ~B);
```