Quiz #1: Beginnings and Basics
CS 4341-502
Assigned: February 14, 2022
Due: February 18, 2022
11:59 pm "End of Day"

"Loretta Salino"

Announcement:

This quiz is worth 10% of the semester grade.

Objective:

Problems concerning the second portion of the first half of the semester: working K-maps, with and without don't care cases, and drawing an accompanying circuit.

REQUIREMENTS

If you do not meet these requirements, this paper will not be graded.

- You may work on this paper by yourself, or with classmates, or with other resources so long as you acknowledge them in part 1 of this assignment. If you do not do the acknowledgement, the paper will not be graded.
- You must use handwriting and hand drawing for your numbers, logic, and mathematics. If you do not, your paper will not be graded. You may use software to layout tables, maps, and charts.
- You must turn this file in as a PDF file. You are expected to have the ability to acquire freeware, photograph or scan your work, and put them into a file. If you do not submit the work as a PDF, your paper will not be graded.
- You must do your work in your own handwriting, or your paper will not be graded. It two papers have the same handwriting, neither paper will be graded.
- You must use the order of significance, the notation for equations based on the textbook, and the values of 1 and 0 for true and false for this paper, or it will not be graded.
- You must submit the file in the form of <yournetid>.quiz2.pdf into blackboard.

Part 1. Transparency:

For this Quiz, I am allowing it to be open book, open internet, even peer assistance. So long as you **DOCUMENT** all your sources. In addition, if you are using additional software or web pages or social media, please name them in this problem. If you are doing this quiz alone, state so. ***If this question is left blank, then the quiz will not be graded.***

Part 2: 4-Bit Karnaugh Maps

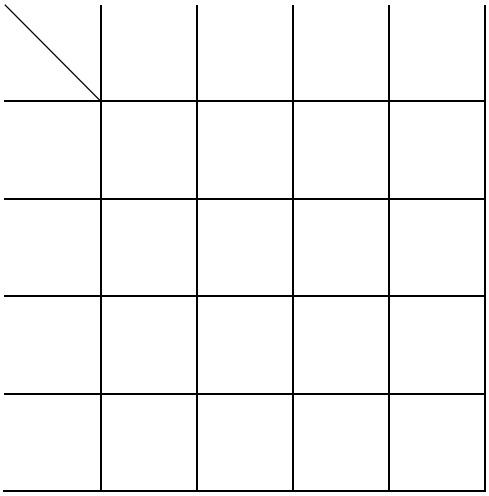
2.1 Truth Table. (5 points)

Given: The equation for this circuit is: S(1, 2, 3, 4, 5 ,6, 9, B, D, F)

Find: Fill out the Truth Table

	Inputs				Output
#	R	O	S	T	f (A, B, C, D)
0	0	0	0	0	
1	0	0	0	1	
2	0	0	1	0	
3	0	0	1	1	
4	0	1	0	0	
5	0	1	0	1	
6	0	1	1	0	
7	0	1	1	1	
8	1	0	0	0	
9	1	0	0	1	
A	1	0	1	0	
B	1	0	1	1	
C	1	1	0	0	
D	1	1	0	1	
E	1	1	1	0	
F	1	1	1	1	

2.2 K-Map (5 points)
Given: Truth Table from 2.1
Find: Fill out the K-Map, including variable labels



2.3 List the Implicants (14 points)
Given: K-Map from 2.2
Find: List all possible implicants

Show the implicants as a set of the row numbers of the truth table.

a. How many possible implicants are of size 2, and what are they?

b. How many possible implicants are of size 3, and what are they?

c. How many possible implicants are of size 4, and what are they?

d. How many possible implicants are of size 5, and what are they?

e. How many possible implicants are of size 6, and what are they?

f. How many possible implicants are of size 7, and what are they?

g. How many possible implicants are of size 8, and what are they?

2.4 Normalized Equation (10 points)

Given: 2.3
Find: Solve for the sum-of-products, least-terms, least operations, form of the equation.,

2.5 Verification (5 Bonus)
Given: Equation from 2.4, table from 2.1
Find: Fill the Truth Table

Fill out the new truth table, one term per column, and then the result of the sum-of-products in the next-to-last column, and the results from question 2.1 for the last column. This is to verify the result. And yes, the given table may have blank columns.

	Inputs				Terms						result	prob. 2.1
#	R	O	S	T							f(R, O, S, T)	f(R, O, S, T)
0	0	0	0	0								
1	0	0	0	1								
2	0	0	1	0								
3	0	0	1	1								
4	0	1	0	0								
5	0	1	0	1								
6	0	1	1	0								
7	0	1	1	1								
8	1	0	0	0								
9	1	0	0	1								
A	1	0	1	0								
B	1	0	1	1								
C	1	1	0	0								
D	1	1	0	1								
E	1	1	1	0								
F	1	1	1	1								

2.6 Circuit (10 points)

Given: Equation from 2.4

Find: Draw the circuit for the simplified equation.

Part 3: Karnaugh Maps utilizing Don’t Care cases

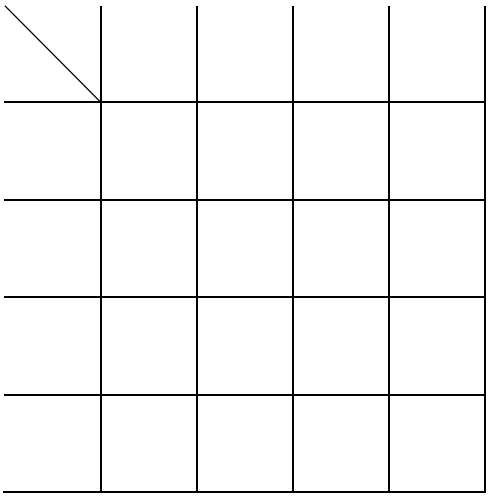
The truth table for a circuit is:

	Inputs				Output
#	R	I	F	T	g (R, I, F, T)
0	0	0	0	0	1
1	0	0	0	1	0
2	0	0	1	0	X
3	0	0	1	1	X
4	0	1	0	0	1
5	0	1	0	1	1
6	0	1	1	0	X
7	0	1	1	1	0
8	1	0	0	0	0
9	1	0	0	1	0
A	1	0	1	0	1
B	1	0	1	1	X
C	1	1	0	0	X
D	1	1	0	1	0
E	1	1	1	0	1
F	1	1	1	1	0

3.1 K-Map. (5 points)

Given: The truth table in part 3.

Find: Fill out the K-Map, including variable labels. Replace all Don’t Care cases with 0.



3.2 List Implicants (5 points)
Show each essential implicant as a set of the row numbers of the truth table **treating the Don't Care Cases if they were 0.**

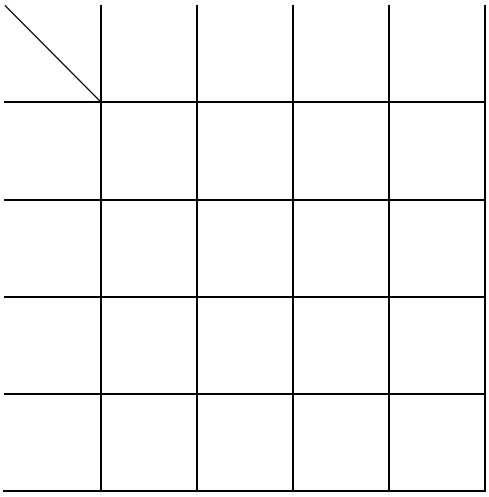
3.3 Equation (10 points)

Given: Implicants from 3.2

Find: Solve for the sum-of-products, least-terms, form of the equation.

3.4 K-Map. (5 points)
Given: The truth table in part 3.

Find: Fill out the K-Map, including variable labels, and use X for the Don’t Care cases.



3.5 List Implicants (5 points)

Show the implicants as a set of the row numbers of the truth using the Don't Care cases to your best advantage. Careful, there are multiple correct answers, but you should list out the most advantageous implicants. (5 points)

3.6 Solve for the sum-of-products, least-terms, form of the equation using the Don’t Care cases. (10 points)

3.7 Compare Equations (6 points)

How many literals (variables including repeats) are in the equation from 3.3? How many terms? How many NOTs?

How many literals (variables including repeats) are in the equation from 3.6? How many terms? How many NOTs?

3.8 Draw the second equation as a circuit. (10 points)