About how many total hours did you spend actively working on this assignment? _____

Q1 [4 points] *Time spent on Q1:* _____

F1 =

F2 =

A	B	C		F1	F2
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

Q2 [6 points] *Time spent on Q2:* _____

Draw your three circuits here:

Q3 [5 points] *Time spent on Q3:* _____

a [2] bexp$_3$ =

b [3] circuit diagram:

Q4 [5 points] *Time spent on Q4:* _____

a [2] bexp$_4$ =

b [3] circuit diagram:

Q5 [10 points] *Time spent on Q5:* _____

Truth table for parts a [2] and c [1]

A	B	AB	A'B'	AB + A'B'	bexp$_{5b}$	AB + bexp$_{5b}$
0	0					
0	1					
1	0					
1	1					

Below, show steps in deriving the answer expressions

b [1] bexp$_{5b}$ =

d [1.5] bexp$_{5d}$ =

e [2] bexp$_{5e}$ =

f [2.5] bexp$_{5f}$ =

Q6 [18 points] *Time spent on Q6:* _____

Q6a [5 points] *Time spent on Q6a:* _____

Truth table

A	B	C	output
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

Derivation (you are given more rows than you need; box, underline, or color all redexes)

Simplification steps	Law(s) used to simplify redex in previous line
ABC + ABC' + A'C + A'B'C + AB'C	

Q6b [Independent] [6 points] *Time spent on Q6b:* _____

Truth table

A	B	C	output
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

Derivation (you are given more rows than you need; box, underline, or color all redexes)

Simplification steps	Law(s) used to simplify redex in previous line
A'B' + A'BC' + (A + C')'	

Q6b [Independent] [6 points] *Time spent on Q6b:* _____

Q6c [Independent] [7 points] *Time spent on Q6c:* _____

Truth table

A	B	C	D	output		A	B	C	D	output
0	0	0	0			1	0	0	0	
0	0	0	1			1	0	0	1	
0	0	1	0			1	0	1	0	
0	0	1	1			1	0	1	1	
0	1	0	0			1	1	0	0	
0	1	0	1			1	1	0	1	
0	1	1	0			1	1	1	0	
0	1	1	1			1	1	1	1	

Derivation (you are given more rows than you need; box, underline, or color all redexes)

Simplification steps	Law(s) used to simplify redex in previous line
A' + A'B'CD' + A'B'C'D' + AB'C' + AB'CD' + ABD + BC'D	

Q7 [12 points] *Time spent on Q7:* _____

Q7a [6] Express XOR in terms of 2-input NAND gates. Show both the final circuit
and your derivation/explanation   *Time spent on Q7a:* _____

**Q7b [6] Express XOR in terms of 2-input NOR gates. Show both the final circuit
and your derivation/explanation.**   *Time spent on Q7b: _____*