CS 240 Gates [50 points]   **Your ID Number:**

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

a.   **Counterexample or explanation:**
☐ Equivalent
☐ Not equivalent

b.   **Counterexample or explanation:**
☐ Equivalent
☐ Not equivalent

c.   **Counterexample or explanation:**
☐ Equivalent
☐ Not equivalent

d. [Independent]   **Counterexample or explanation:**
☐ Equivalent
☐ Not equivalent

Q4 [10 points]   *Time spent on Q4: _____*
Truth table for parts a [2] and c [2]

A	B	AB	A'B'	AB + A'B'	$bexp_{4b}$	AB + $bexp_{4b}$
0	0					
0	1					
1	0					
1	1					

Below, show steps in deriving the answer expressions

b [1] $bexp_{4b}$ =

d [2] $bexp_{4d}$ =

e [3 *independent*] $bexp_{4e}$ =

Q5 [5 points]   *Time spent on Q5:* _____

a [2] bexp$_5$ =

b [3] circuit diagram:

Q6 [5 points]   *Time spent on Q6:* _____

a [2 *independent*] bexp$_6$ =

b [3 *independent*] circuit diagram:

Q7 [8 points]   *Time spent on Q7:* _____

a [4] Express XOR in terms of 2-input NAND gates.

b [4 *independent*] Express XOR in terms of 2-input NOR gates.

Q8 Universal Muxification of Gates [8 points]   *Time spent on Q8:* _____

a. NOT A [1 point]

b. A AND B [2 points]

c. A OR B [2 *independent*]

d. A NAND B [3 *independent*]