

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

**Q1 [4 points]** Time spent on Q1: \_\_\_\_\_

**Truth Tables**

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			

**Unsimplified Boolean Expressions**

**F2 =**

**F1 =**

**Q2 [6 points]** Time spent on Q2: \_\_\_\_\_

**Q3 [4 points]**

*Time spent on Q3:* \_\_\_\_\_

**a [1]**

**Counterexample or explanation:**

- Equivalent
- Not equivalent

**b [1]**

**Counterexample or explanation:**

- Equivalent
- Not equivalent

**c [1] [Independent]**

**Counterexample or explanation:**

- Equivalent
- Not equivalent

**d [1] [Independent]**

**Counterexample or explanation:**

- Equivalent
- Not equivalent

**Q4 [5 points]** *Time spent on Q4:* \_\_\_\_\_

**a [2] bexp<sub>4</sub> =**

**b [3] circuit diagram:**

**Q5 [5 points]** *Time spent on Q5:* \_\_\_\_\_

**a [2] bexp<sub>5</sub> =**

**b [3] circuit diagram:**





Q7 [10 points]

Time spent on Q7: \_\_\_\_\_

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

A	B	AB	A'B'	AB + A'B'	bexp <sub>7b</sub>	AB + bexp <sub>7b</sub>
0	0					
0	1					
1	0					
1	1					

Below, show steps in deriving the answer expressions

b [1] bexp<sub>7b</sub> =

d [2] bexp<sub>7d</sub> =

e [2] [independent]  
bexp<sub>7e</sub> =

f [3] [Independent]  
bexp<sub>7f</sub> =

**Q8 [12 points]** *Time spent on Q8:* \_\_\_\_\_

**Q8a [6]** Express XOR in terms of 2-input NAND gates. Show both the final circuit *and* your derivation/explanation

*Time spent on Q8a:* \_\_\_\_\_

**Q8b [Independent] [6] Express XOR in terms of 2-input NOR gates.**

**Show both the final circuit \*and\* your derivation/explanation**

*Time spent on Q8b:* \_\_\_\_\_

**Q9 Decoding a T-Shirt [8 points]** *Time spent on Q9:* \_\_\_\_\_

**1a [2 points]** Message in base of flag:

**Hex pairs:** 43 53 33 34 32 20 43 6f 6d 70 75 74 65 72 20 53 65 63 75 72 69 74 79  
**ASCII:**

**Decoded message from base of flag:**

**1b [6 points]** Message in binary bits of the flag. Write down the bits and show your decoding details.

**Q10 Decoding a Unicode Message [12 points]** *Time spent on Q10:* \_\_\_\_\_

**2a [10 points]** Show how to decode the Unicode message in the hex bytes 49 E2 99 A5 CF 80 21 to Unicode code points. Write the **message bits** corresponding to the hex bytes, distinguish **header** bits from **content** bits, and indicate **the number of bytes in each code point**. Show the **code points** determined by the content bits.

**2b [2 points].** What would the message look like in a Unicode enabled application?