COMP2611 Spring 2016 Homework #1 Answer Sheet

(Due Monday Mar 7 5PM)

Name: _____ **Stu ID:** _____

Note:

- **This is an individual assignment; all the work must be your own.**
- **Submit a pdf file via CASS. Change this file name to *<your_stu_id>.pdf* (without the brackets)**
- **Use Logisim to draw all digital circuits, and paste the image into your homework.**

Question 1: Data representation, conversion between bases

a)

$146_{(10)}$ = $0000\ 0000\ 1001\ 0010_{(2)}$ = $0092_{(16)}$

$F0D1_{(16)}$ = $1111\ 0000\ 1101\ 0001_{(2)}$ = $-3887_{(10)}$

b)

$146_{(10)}$ = $0000\ 0000\ 0000\ 0000\ 0000\ 0000\ 1001\ 0010_{(2)}$ = $0000\ 0092_{(16)}$

$F0D1_{(16)}$ = $1111\ 1111\ 1111\ 1111\ 1111\ 0000\ 1101\ 0001_{(2)}$ = $-3887_{(10)}$

Or = $0000\ 0000\ 0000\ 0000\ 1111\ 0000\ 1101\ 0001_{(2)}$ = $61649_{(10)}$

c)

$146_{(10)}$ = $0000\ 0000\ 0000\ 0000\ 0000\ 0000\ 1001\ 0010_{(2)}$ = $0000\ 0092_{(16)}$

$F0D1_{(16)}$ = $0000\ 0000\ 0000\ 0000\ 1111\ 0000\ 1101\ 0001_{(2)}$ = $61649_{(10)}$

d)

i. 3.75

$3.75 = 11.11_{(2)} = 1.111_{(2)} * 2^1$,

$S = 0$, $E = 1+127 = 1000\ 0000_{(2)}$,

Significand = 111 0000 0000 0000 0000 0000

ii. -313.3125

$-313.3125 = -100111001.0101_{(2)} = -1.001110010101_{(2)} * 2^8$,

$S = 1$, $E = 8+127 = 1000\ 0111_{(2)}$,

Significand = 001 1100 1010 1000 0000 0000

e)

i. 0 00000000 11100000000000000000000

$= 0.111_{(2)} * 2^{-126} = 1.0285 * 10^{-38}$ (Note that exponent = 0)

ii. 1 10000001 00011000000000000000000

$= -1.00011_{(2)} * 2^{2} = -1.09375 * 2^{2} = -4.375$

Question 2: Boolean algebra and Combinational logic

a) $\overline{\overline{ABC} + \overline{A}B} = \overline{ABC} * \overline{\overline{A}B} = (\overline{A} + \overline{B} + \overline{C}) * (A + \overline{B}) = \overline{B} + A\overline{C}$

b) $\overline{A}BC + A\overline{B}\overline{C} + \overline{A}\overline{B}\overline{C} + A\overline{B}C + ABC = BC + \overline{BC} + A\overline{B}$

or $BC + \overline{BC} + AC$

A \ BC	00	01	11	10
0	1	0	1	0
1	1	1	1	0

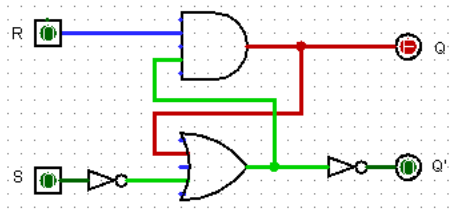
c) $(\overline{A} + \overline{B})(\overline{C} + \overline{D})(\overline{B} + D) = \overline{ABC} + \overline{ABD} + \overline{AC}D + \overline{BC} + \overline{BD} + \overline{BC}D = \overline{BC} + \overline{BD} + \overline{AC}D$

AB \ CD	00	01	11	10
00	1	1	0	1
01	0	1	0	0
11	0	0	0	0
10	1	1	0	1

Question 3: Sequential logic

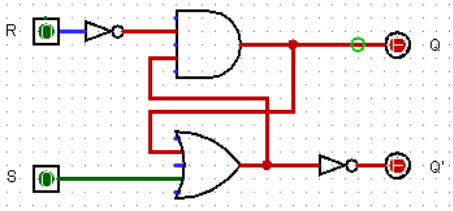
a)

R	S	Q	Q'
0	0	Invalid Input	
0	1	0	1
1	0	1	0
1	1	Latch	



b)

R	S	Q	Q'
0	0	Latch	
0	1	0	1
1	0	1	0
1	1	Invalid Input	



c)