Name: **Set:**

BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY – Midterm Examination

Program:	Computer Systems Technology	
Course Name:	Applied Mathematics for CST	
Course Number:	COMP 1113	
Date:	October 26, 2015	
Time Allotted:	50 minutes	
Exam Pages	6	(Including this page)
Total Marks	25	(25% of this course)

Special Instructions:

1.) **All work is to be done in this examination booklet.**

2.) **Students are NOT permitted the use of an electronic calculator.**

3.) **Textbooks and Notes are <u>NOT</u> allowed!**

4.) **Boolean theorems and postulates are provided.**

5.) **Please turn off your cell phone and put it away.**

6.) **Stay in your seat until instructed to hand-in your paper.**

1.) [4 marks] Convert each of the following numbers from the base in which they are given to the indicated base.

a.) $(1\ 1\ 0\ 0\ 1\ 0\ 1\ 0.\ 0\ 1\ 1\ 1\ 1\ 1\ 1)_2$ to Hexadecimal.

b.) $(27.4)_8$ to base 5.

2.) [2] Convert the following sequence of decimal numbers to hexadecimal.

Decimal	152	153	154	155	156	157	158	159	160	161
Hexadecimal										

3.) [3 marks]

a.) Add the following 8-bit two's complement numbers. **Indicate whether or not overflow occurred.**

0 1 0 0 0 1 1 1
+ 0 1 0 1 0 1 1 0

b.) What is the decimal result of your addition in part a.).

4.) [4] Use a **5-bit** representation to write the following decimal numbers in each of the listed representations, where possible. Indicate if it is not possible to represent the number in a particular representation. Show your work in the space provided.

Decimal Number	Sign Magnitude	Two's Complement	Excess	Bias 15
13				
–16				

5.) [4] Express the following decimal numbers in a floating point representation according to the mini-standard. Indicate for each whether the floating point representation *exactly* records the decimal number. If not, indicate what decimal number the floating point representation does record exactly (1 sign bit, 4 exponent bits, and 5 mantissa bits with the exponent recorded in bias 7).

Decimal Number	Sign	Exponent	Mantissa	Decimal Number Recorded Exactly
$-\infty$				
1/256 + 1/4096 = 17/4096				

6.) [6] Complete parts a.) through d.) to add the following decimal numbers in a mini-standard floating point representation.

a.) Express each decimal number in **normalized** form in the mini-standard. If it is not possible to express the given number in normalized form, use unnormalized form. Indicate (yes/no) whether any loss of precision occurred in representing either number in the mini-standard.

Decimal	Normalized/Unnormalized form			Loss?
7.6 =				
204 =				

b.) **Standardize** the numbers to the same exponent being sure to show the 'hidden' bit.. Indicate (yes/no) whether any loss of precision occurred in either number while standardizing.

Decimal	Standardized	Loss Here?
7.6 =		
204 =		

c.) Add, and renormalize if necessary to give your result in **normalized** form in the mini-standard. If it is not possible to express the result in normalized form, use unnormalized form. Indicate (yes/no) whether any loss of precision occurred in this step of the process.

Decimal	Normalized/Renomalized			Loss Here?
7.6 + 204				

d.) Determine what decimal number the result represents **exactly** (which may or may not be the same as the result of the addition/subtraction problem).

Decimal Answer:

7.) Given the following Boolean expression: $z*(x + y) = y*z + x * y' * z$

[2] Prove that the expression is true using a truth table. Do not simplify or use any Boolean theorems.

x	***y***	***z***	
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	