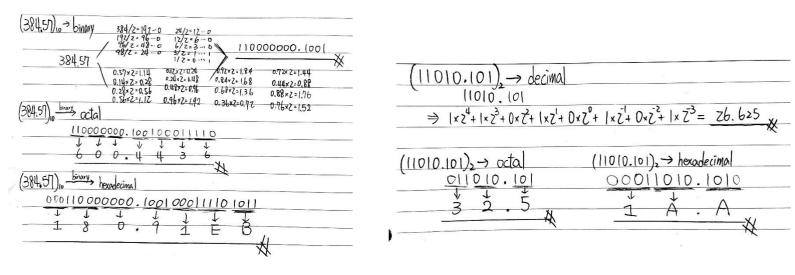
HW1

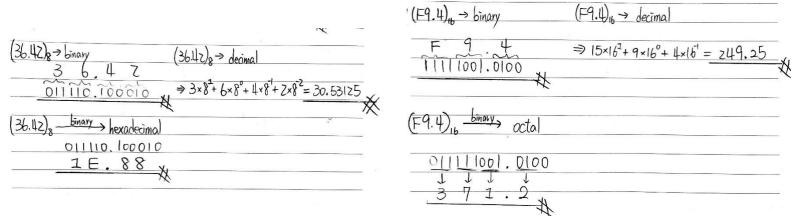
1. (8%) What is the exact number of bits in a system that contains (a) 16M byte and (b) 8.3G byte?

(a) 16M Byte = $16 * 2^20 * 2^3$ => 134,217,728(b) 8.3G Byte = $8.3 * 2^30 * 2^3(71,296,457,113.6)$ => 71,296,457,114

2. (24%) Convert the following numbers from the given base to other three bases listed in the table:

Decimal	Binary	Octal	Hexadecimal
384.57	110000000.1001	600.4436	180.91EB
26.625	11010.101	32.5	1A.A
30.53125	11110.10001	36.42	1E.88
249.25	11111001.01	371.2	F9.4





3. (16%) Perform the subtraction with the following unsigned binary numbers by taking the 2's complement of the subtrahend. (a) 0111-0110, (b) 10010-1010, (c) 1010110-1111010, (d) 101101-110.

(a)	(6)
D 00 0111	001 0010
+11 1010	+1110110
00 000 1	000 1000
(c)	(d)
001010110	00101101
+ 000000110	+11111010
101011100	00100111

4. (16%) Convert decimal +47 and +38 to binary, using the signed-2's-complement representation and enough digits to accommodate the numbers, Then, perform the binary equivalent of (+47)+(-38) and (-47)+(-38) using addition. Convert the answers back to decimal and verify that they are correct.

$$4 |_{(10)} = 00|0_{-1||1|(2)} -4 |_{(0)} = |10|_{-000}|_{(2)}$$

$$38_{(10)} = 00|0_{-0}|10_{(2)} -38_{(10)} = |10|_{-10|0_{(2)}}$$

$$00|0_{-1||1_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|_{-10|0_{(2)}} + |10|$$

5. (10%) Write the word "Logic" in ASCII using an eight-bit code including the space. Treat the leftmost bit of each character as a parity bit. Each 8-bit code should have even parity.

L: 1100 1100 o: 0110 1111 g: 1110 0111

↓---- parity bit

i: 0110 1001 c: 0110 0011 6. (8%) For an 8-bit sequence is 1101 0111. What is its content if it represents (a) two decimal digits in BCD? (b) two decimal number in the Excess-3 code? (c) an 8-bit unsigned number? (d) an 8-bit signed number?

a.
$$1101_{(2)} = unused_{(10)}$$
 $0111_{(2)} = 7_{(10)}$

b.
$$1101_{(2)} = 10_{(10)}$$
 $0111_{(2)} = 4_{(10)}$

c.
$$1101\ 0111_{(2)} = 215_{(10)}$$

d.
$$1101\ 0111_{(2)} = -87_{(10)}$$

7. (6%) If you have 27 books and want to give each book a unique id with a binary number. If we want to use as least as possible the number of bits as the id, how many bits do you need?

27 unique IDs which means the number of bits you need could at least represent 27 unique numbers .

$$2^5 > 27 > 2^4$$

Ans: 5 bits

8. (12%) Find the Gray code sequence of 12 code words.

	M=2k=12 , k=6			
	3	$(g_3 = 0)$ (MSB = 0)		
D	dadadido 93 92 91 90	$9 = d_3 \oplus d_2 = 0 \oplus 0 = 0$		
0	0000 -> 0000	9,=d=01=000=0		
1	0001-0001	90 = d1 & d0 = 0 & 0 = 0		
2	0010 -> 0011			
3	0011 > 00/0			
4	0100-0110			
5	0101-0111			
		For the rest half codes		
6	$0/10 \rightarrow 1/1/$	set MSB=1		
7	0111->1110	then copy in neverse order of		
8	1000-1010	first half part!		
9	1001-1011			
10	1010-1001			
//	1011-1000			