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Digital Logic: ECEN 214

Problem Set:

Chapter 4: 1-8, 10-12

1) Binary: 10110 + 00011 = 11001 = 1001

Decimal: 6 + 3 = 9

2) Binary: 11110 + 00111 = 00101

Decimal: -14 + 7 = -7

no overflow, 5 is within range of 4 bits

3) No, when there is and overflow the output is not correct the front bit gets lobbed off and goes to the overflow indicator. The processor should tell the user that an overflow has occured

0100 0001
0B11 0000
1100 1111
17 15

4) Hex
0x BA
+0x 7F
0x 29

Decimal
-86
+127
41

BA
1011 1010
0100 0101
0101 0110
5 6
20 46 = -86

7F
0111 1111
1000 0000
1001 0001
9 1

No PBS does not result in an overflow

5) Binary
1110
+1001
10111
↳ overflow

Decimal
-2
+-7
-9

1001
0110
0111
0001
0010

0110
0111

Yes! PBS did result in an overflow. The number -9 cannot be expressed with 4 bits in 2's Comp.

6) Function table for Signed addition

X	Y	Cin	Sum
x	y	Cin	(X+Y+Cin) mod 2^7

Logic Table

7)

S_M	S_b	C_m	C_{out}	S_s	Ovf
0	0	0	0	0	0
0	0	1	0	1	1
0	1	0	0	1	0
0	1	1	1	0	0
1	0	0	0	1	0
1	0	1	1	0	0
1	1	0	1	0	1
1	1	1	1	1	0

Logic Expression

$C_m \oplus C_{out}$

8)

10) The Subtraction code is linked to the Carry-in line because we can force a carry in on the least significant number to accomplish the add-one the performs the negation.

11) It doesn't save any gates! They are the same.

12) The borrow signal tells you when the result is undefined. This means the bit pattern representing the sum is not correct as it appears.