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COMP 3350 – Project 1

1. A.) 0110 0001 1111

* First step is to convert to decimal
* 0x2^11+1x2^10+1\*2^9+…….+1x2^0
* Decimal representation is 1567
* Now we convert to hexadecimal
* 61F

B.) 1000 1111 1100

- First step is always to convert to decimal using the same method as A

- Decimal representation is 2300

- Convert to hexadecimal

- 8FC

C.) 0001 0110 0100 0101

- Convert to decimal

- Decimal representation is 5701

- Convert to hexadecimal

- 1645

1. A.) 1100 1010

* Signed: -54 (Same steps as question 1 but leading digit is sign)
* 1s complement: -53 (always 1 more than decimal)
* 2s complement: -54 (2s is same)

B.) 1111 0010  
- Signed: -14 (Same steps as question 1 but leading digit is sign)  
- 1s complement: -13 (always 1 more than decimal  
- 2s complement: -14 (2s is same)

C.) 1000 0111  
- Signed: -121 (Same steps as question 1 but leading digit is sign)  
- 1s complement: -120 (always 1 more than decimal)  
- 2s complement: -121 (2s is same)

1. A.) -100(10)

* Take -100 and divide by two keeping the remainder
* Assuming signed 8 bit: 1001 1100
* 1s complement: 0110 0011 (invert digits)
* 2s complement: 0110 00100 (add 1 to end of 1s complement)

B.) -16(10)   
- Take -16 and divide by two, keeping the remainder  
- Assuming signed 8 bit: 1111 0000  
- 1s complement: 0000 1111  
- 2s complement: 0001 0000  
C.) -21(10)  
- Take -21 and divide by two, keeping the remainder  
- Assuming signed 8 bit: 1110 1011  
- 1s complement: 0001 0100  
- 2s complement: 0001 0101  
D.) -0(10)  
- 0000 0000  
- 1s complement: 1111 1111  
- 2s complement: 0001 0000 0000

1. A.) Range of an unsigned 7-bit number?

* Range is typically 0 to (2n-1), so it is 0 to (27-1)
* 0 to 127

B.) Range of a signed 7-bit number?  
- Range with signed is (2n-1-1) to (2n-1-1); signed on both  
- (26-1) to (26-1); -63 to 63

1. A.) 1000 AND 1110

- Check each bit (if both are 1, then the result is 1)

- 1000

B.) 1000 OR 1110  
- Check each bit (if either is 1, then result is 1)  
- 1110

C.) (1000 AND 1110) OR (1001 AND 1110)  
- AND operations first – (1000) OR (1000)  
- OR operation second: 1000

1. 25 – 65 = -40
   1. Not sure how to show work on word, but I will describe in words as best as I can
   2. Take the 1s place and subtract (5 – 5) = 0; We are left with 20 – 60 (since this operation would be invalid for positive math, we will need to go into the negative)
   3. Flip the equation and do 60 – 20 and add the sign back; -40
2. Verify the answer from Q6 using conversion of 2s and decimal numbers
   1. 25 in binary is 0001 1001
   2. -64 in 2s complement is 1011 1111
   3. Subtraction in 2s complement would follow the same steps, but carry from larger bit and add
   4. 0001 1001 + 1011 1111 = 1101 1000
   5. 1101 1000 converted to decimal is -40