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CDA 3100
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ASSIGNMENT 1

1. Convert the following base-10 numbers into their 2's compliment form. Represent the values using widths of 8b, 16b, and 32b. If a number cannot be represented correctly using a particular width, state that there was an "overflow." (9)
a) 17
8b- 0001 0001
16b- 0000 0000 0001 0001
32b- 0000 0000 0000 0000 0000 0000 0001 0001

b) -42
8b- 1101 0110
16b- 1111 1111 1101 0110
32b- 1111 1111 1111 1111 1111 1111 1101 0110

c) 4125
8b- 1000000011101 – OVERFLOW
16b – 0001 0000 0001 1101
32b- 0000 0000 0000 0000 0001 0000 0001 1101

2. Convert the following unsigned binary numbers into octal, decimal, and hexadecimal. (9)
a) 0110 1101 1110 0101 0000 1110 1100 0000
Oct – 15,571,207,300
Dec – 1,843, 728, 064
Hex – 6DE50EC0

b) 1011 1100 1111 0100 0011 1011 0011 1010
Oct – 27,475,035,472
Dec – 3,170,122,554
Hex – BCF43B3A

c) 1100 1000 0000 0000 1000 1000 1000 0110
Oct – 31,000,104,206
Dec – 3,355,478,150
Hex – C8008886

3. Convert the following signed binary numbers into their decimal equivalent. Show the conversion for both 1's and 2's compliment. (6)
a) 1111 1111 1111 1111 0100 0111 0010 0000
1's – 0000 0000 0000 0000 1011 1000 1101 1111
2's – 0000 0000 0000 0000 1011 1000 1110 0000
Dec. -47,328

b) 0111 1111 1111 1111 1111 1111 1111 1100

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1's – 1000 0000 0000 0000 0000 0000 0000 0011
2's – 1000 0000 0000 0000 0000 0000 0000 0100
Dec. 2, 147,483,644

c) 1000 1111 0110 0100 1011 1101 0111 0110
1's – 0111 0000 1001 1011 0100 0010 1000 1001
2's – 0111 0000 1001 1011 0100 0010 1000 1010
Dec. -1,889,223,306

4. Show the IEEE 754 single-precision binary representation of the following base-10 numbers. You must show all of your work. (12)
a) 1.75
(1b = sign, 8b = exponent, 23b = mantissa)
1 = 1
.75 = …
2(.75)= 1.5 = 1
2(.5) = 1.0 = 1
.75 = 11
Combine the two: 1.11
(Remove invisible^1…= 11
0 xxxx xxxx 110 0000 0000 0000 0000 0000
Exponent = 127 + 0 = 127
Exponent = 1111111
IEEE 754 single precision - 0011 1111 1110 0000 0000 0000 0000 0000
Or 3FE00000

b) 42
sign =0
exponent = 2^5, 127+5= 132 = 10000100
mantissa = 42 = 0101000000000000000000
IEEE 754 single precision - 0100 0010 0010 1000 0000 0000 0000 0000
Or 42280000

c) -8.3
sign = 1
exponent = 2^3 = 130 = 1000 0010
mantissa(8) = 1000.0
mantissa(.3) = 0100110011001100
Combine the two = 1000.0100 1100 1100 1100 110
Mantissa(8.3) = 1.000 0100 1100 1100 1100 110
= 000 0100 1100 1100 1100 1101
IEEE 754 single precision – 1100 0001 0000 0100 1100 1100 1100 1101
Or C104CCCD

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