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

**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 = 01010000000000000000000**

**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**