Comp 2401A Assignment 1

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**Question 1:**

1. Binary Systems: 2n = 29 = 512 different values
2. Hexadecimal Systems: 16n = 169 = 68,719,476,736 different values
3. Octal Systems: 8n = 89 = 134,217,728 different values

**Question 2:**

1. (245)8 Decimal Equivalent = 165

1. (FAC1)16 Decimal Equivalent = 64,193
2. (312)4 Decimal Equivalent = 54
3. (10110110)2 Decimal Equivalent when interpreted as a two’s compliment (64 + 8 + 2) = 74

(10110110)2 Decimal Equivalent when interpreted as a unsigned number = 182

1. (00010111)2 = (16 + 4 + 2+ 1) = 23

**Question 3:**

1. 0 to 2k – 1

0 to 64 -1

Therefore 0 to 63

1. -32 to 31
2. -31 to 31

**Question 4:**

1. 0 1 0 1 1 1 0 1

+1 0 1 0 1 0 0 1

= **0 1 0 0 0 0 0 1 1 0**

1. 10110111 – 11001011 = 01111100
2. 00000111 \* 00000101 = 00100011

**Question 5:**

1. 72 = 0 1 0 0 1 0 0 0

1’s Compliment = 0 1 0 0 1 0 0 0

2’s Compliment = 0 1 0 0 1 0 0 0

1. 0 = 0 0 0 0 0 0 0 0

1’s Compliment = 0 0 0 0 0 0 0 0

Or

1 0 0 0 0 0 0 0

2’s Compliment = 0 0 0 0 0 0 0 0

1. -128 = 1 0 0 0 0 0 0 0

Cannot be represented using 1’s Compliment as the range of numbers that can be represented using only 8 bits is -127 to 127

2’s Compliment = 1 0 0 0 0 0 0 0 (This is the “Weird number”)

1. -5 = 0 0 0 0 0 1 0 1

1’s Compliment = 1 1 1 1 1 0 1 0

2’s Compliment = 1 1 1 1 1 0 1 1

**Question 6:**

1. Unsigned Integer = 88

1’s Compliment = 88

2’s Compliment = 88

Excess 127 = 215

1. Unsigned Integer = 185

1’s Compliment = -70

2’s Compliment = -71

Excess 127 = 312

**Question 7:**

1. Step 1: 0 (Sign bit)

Step 2: 0 0 0 1 1 . 0 1 1 (fixed point binary)

Step 3: 1 . 1 0 1 1 \* 21 (normalize)

1. Step 1: 1 (Sign bit)

Step 2: -1 . 0 1 0 (fixed point binary)

Step 3: -1 . 0 1 0 \* 20 (normalize, no need to move decimal so we have 20)

**Question 8:**

1. Step 1: 0 (Sign bit)

Step 2: 1 0 . 0 1 (fixed point binary)

Step 3: 1 . 0 0 1 \* 21 (normalize) (1 . 0 0 1 is the mantissa)

Step 4: Exponent = 1 -3

= signed value of -2

= 1 1 0 (3 bit exponent in excess-3 notation)

Therefore the number 2.25 be stored in the byte as 0 1 1 0 1 0 0 1

1. -2.5