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Logic design (Fall 2016)

Quiz # 1

Name:_____ID:_____

1. (30%+20%) Convert 65.4_7 to binary and then to hexadecimal.
   Hint: convert binary to hexadecimal by inspection.

   Ans:

   $$\mathbf{65.4_7 = 6 \times 7^1 + 5 \times 7^0 + 4 \times 7^{-1} = 42 + 5 + 4/7 = 47\frac{4}{7}_{10}}$$

   $$\mathbf{\frac{47}{2} = 23 \ldots 1 \Rightarrow \frac{23}{2} = 11 \ldots 1 \Rightarrow \frac{11}{2} = 5 \ldots 1 \Rightarrow \frac{5}{2} = 2 \ldots 1}$$

   $$\mathbf{\Rightarrow \frac{2}{2} = 1 \ldots 0 \Rightarrow \frac{1}{2} = 0 \ldots 1}$$

   $$\mathbf{4/7 \times 2 = 1\frac{1}{7} \Rightarrow 1/7 \times 2 = \frac{2}{7} \Rightarrow 2/7 \times 2 = \frac{4}{7}}$$

   $$\mathbf{65.4_7 = 101111.\underline{100}_2 = 0010\ 1111.\underline{1001\ 0010\ 0100}_2 = 2F.\underline{924}_{16}}$$

2. Represent A and B as two 5-bit 1's complement numbers, denoted by a and b, respectively. Calculate $a - b$ by adding the complement of b to a. Indicate when an overflow occurs.
   Hint: $a - b = a + (-b)$
   (a) $A = 11_{10}$ and $B = -6_{10}$
   (b) $A = -8_{10}$ and $B = 7_{10}$

(a) $a = 01011$, $b = 11001$

```
  01011
+ 00110
  10001
```

Overflow

(b) $a = 10111$, $b = 00111$

```
  10111
+ 11000
(1)01111
     1
  10000
```

No Overflow