Logic design (Fall 2018)

Quiz # 1

Name:_____ID:_____

1. (30%+20%) Convert 163.5_7 to binary and then to hexadecimal.

    Hint: convert binary to hexadecimal by inspection.

    Ans:

    $$163.5_7 = 1 \times 7^2 + 6 \times 7^1 + 3 \times 7^0 + 5 \times 7^{(-1)} = 49 + 42 + 3 + 5/7 = 94\frac{5}{7}_{10}$$

    $$\frac{94}{2} = 47 \dots 0 => \frac{47}{2} = 23 \dots 1 => \frac{23}{2} = 11 \dots 1 => \frac{11}{2} = 5 \dots 1$$

    $$=> \frac{5}{2} = 2 \dots 1 => \frac{2}{2} = 1 \dots 0 => \frac{1}{2} = 0 \dots 1$$

    $$5/7 \times 2 = 1\frac{3}{7} => 3/7 \times 2 = \frac{6}{7} => 6/7 \times 2 = 1\frac{5}{7} => 5/7 \times 2 = 1\frac{3}{7} => \cdots$$

    $$163.5_7 = 1011110.\underline{101}_2 = 0101\ 1110.\underline{1011\ 0110\ 1101}_2 = 5E.\underline{B6D}_{16}$$

2. (30%)Represent -11_{10} and 4_{10} 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 whether an overflow occurs.   Hint: $a - b = a + (-b)$

    Ans:

    $a = 10100$, $b = 00100$

    ```
        10100
    +   11011
      (1)01111
             1
    _____
        10000
    ```

    No overflow

3. (20%) Represent 247 in excess-3 code.

    Ans:

    0101 0111 1010

     (2)   (4)   (7)