

Logic design (Fall 2017)

Quiz # 1

Name: _____ ID: _____

1. (30%+20%) Convert 354.4_7 to binary and then to octal.

Hint: convert binary to octal by inspection.

Ans:

$$354.4_7 = 3 \times 7^2 + 5 \times 7^1 + 4 \times 7^0 + 4 \times 7^{(-1)} = 147 + 35 + 4 + 4/7 = 186 \frac{4}{7}_{10}$$

$$\frac{186}{2} = 93 \dots 0 \Rightarrow \frac{93}{2} = 46 \dots 1 \Rightarrow \frac{46}{2} = 23 \dots 0 \Rightarrow \frac{23}{2} = 11 \dots 1 \Rightarrow \frac{11}{2} = 5 \dots 1$$

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

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

$$354.4_7 = 10111010.\underline{100}_2 = 010 \ 111 \ 010.\underline{100}_2 = 272.\underline{4}_8$$

2. (25%+25%) 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) $A = -9_{10}$ and $B = 6_{10}$

(b) $A = 11_{10}$ and $B = -5_{10}$

(a) $a = 10110$, $b = 00110$

$$\begin{array}{r} 10110 \\ + \underline{11001} \\ (1)01111 \\ \hline 1 \\ 10000 \end{array}$$

No overflow

(b) $a = 01011$, $b = 11010$

$$\begin{array}{r} 01011 \\ + \underline{00101} \\ 10000 \end{array}$$

Overflow