

Assignment 1: Computer Arithmetic, Fall 2020

Answer

Requirements:

- Organize your assignment solution into one single file in Microsoft Word format or PDF. Note that image format (incl. jpg etc) is not acceptable, however, you may convert jpg files to one single pdf file and then submit it.
 - Submission must be conducted online through Blackboard website.
1. (10 marks) The maximal decimal integer of n -digit is $10^n - 1$. Then its binary representation has about $3.32n$ digits since $\log_2(10^n - 1) \approx n \log_2 10 = 3.32n$.
 2. (15 marks) $(50.6875)_{10} = 110010.1011_2$.
 3. (15 marks) The binary sign-magnitude representations for 50.6875_{10} and -50.6875_{10} are respectively 00110010.1011_2 and 10110010.1011_2 .
 4. (15 marks) The binary biased representations (with Bias = 128) for 50.6875_{10} and -50.6875_{10} are respectively 10110010.1011_2 and 01001101.0101_2 .
 5. (15 marks) The 2's complement representations for 50.6875_{10} and -50.6875_{10} are respectively 00110010.1011_2 and 11001101.0101_2 .
 6. (15 marks) The 1's complement representations for 50.6875_{10} and -50.6875_{10} are respectively 00110010.1011_2 and 11001101.0100_2 .
 7. (15 marks)

$$\begin{array}{r}
 A : \quad 1 \ 1 \ 0 \ 0 \ 1 \\
 + \ B : \quad 0 \ 1 \ 0 \ 1 \ 0 \\
 \hline
 (1) \ 0 \ 0 \ 1 \ 0 \ 1 \quad (\text{no overflow})
 \end{array}$$

$$\begin{array}{r}
 A : \quad 1 \ 1 \ 0 \ 0 \ 1 \\
 + \ C : \quad 1 \ 0 \ 1 \ 0 \ 0 \\
 \hline
 (1) \ 0 \ 1 \ 1 \ 0 \ 1 \quad (\text{overflow})
 \end{array}$$

Represent A and C in 2's complement in 6 bits, $A = 111001$, and $C = 110100$, then we repeat 2's complement addition as follows,

$$\begin{array}{r}
 A : \quad 1 \ 1 \ 1 \ 0 \ 0 \ 1 \\
 + \ C : \quad 1 \ 1 \ 0 \ 1 \ 0 \ 0 \\
 \hline
 (1) \ 1 \ 0 \ 1 \ 1 \ 0 \ 1 \quad (\text{no overflow})
 \end{array}$$