**HOMEWORK 1**

**Question 0:**

**Your SID:** 56865134

**Question 1 (10%):**

We can treat your SID as a decimal integer. Please write your SID as integers in octal and hexadecimal number systems, respectively. Please write the conversion procedure.

**Step1: Divide the integer part by 8, take the remainder and arrange it in reverse order**

Octal = 330730556

**Step2: Divide the integer part by 16, take the remainder and arrange it in reverse order**

Hexadecimal = 363b16e

**Question 2 (10%):**

Please write your SID as BCD and ASCII codes, respectively.

**BCD Conversion**

**5 -> 0101**

**6 -> 0110**

**8 -> 1000**

**6 -> 0110**

**5 -> 0101**

**1 -> 0001**

**3 -> 0011**

**4 -> 0100**

**So, the BCD representation is: 01010110100001100101000100110100**

**ASCII Conversion**

**5 -> 53**

**6 -> 54**

**8 -> 56**

**6 -> 54**

**5 -> 53**

**1 -> 49**

**3 -> 51**

**4 -> 52**

**So, the ASCII representation is: 53 54 56 54 53 49 51 52**

**Question 3 (20%):**

Let X, Y, Z denote the lowest three digits of your SID, then write the 2’s complement representation of -XYZ (i.e., a negative number with absolute value XYZ) in the **16**-digit binary number system. Please write the procedure.

* For example, if the SID is 56865134, then -XYZ is -134.

**Step1:original code of the positive number**

134-> 0000000010000110

**Step2: inverse code of the positive number**

0000000010000110->1111111101111001

**Step3: plus 1 to the inverse code**

1111111101111001->1111111101111010

**Question 4 (20%):**

Let X, Y, Z denote the lowest three digits of your SID, and A, B, C denote the highest three digits of your SID. Please write the binary number of ABC.XYZ. If the fractional part is infinite, please keep as least 6 places in the fractional part. Please write the conversion procedure.

* For example, if the SID is 56865134, then ABC.XYZ is 568.134.

**Step 1: Splitting SID**

Split the given SID=56865134 into two parts:

ABC = 568 (the first three digits)

XYZ = 134 (the last three digits)

**Step 2: Convert ABC to Binary**

Convert ABC (568) to binary.

(568)10= (100011100)2

**Step 3: Convert XYZ to Binary Fraction**

Convert XYZ (134) to a fraction by dividing it by 1000.

To convert the fractional part to binary:

Multiply the fraction by 2 and consider the integer part of the result as the next binary digit.

Continue this process with the remaining fractional part.

If the fractional part becomes zero or if the desired number of binary places has been obtained, then stop.

(0.134)10≈(001000)2 (considering up to 6 places)​

**Step 4: Combining the Results**

Combine the binary results of ABC and XYZ to get the binary representation of ABC.XYZ.

For SID=56865134:

ABC in binary: 1000111000

XYZ in binary: .001000

Combined: 1000111000.001000

**Question 5 (20%):**

Let X, Y, Z denote the lowest three digits of your SID, and A, B, C denote the highest three digits of your SID. Please write the 32-bit floating-point representation of number ABC.XYZ. Please write the procedure.

**Integer part:568 decimal part:134**

**Step1: Divide the integer part by 2, take the remainder and arrange it in reverse order**

568->1000111000

**Step2: Multiply the decimal part by 2, take the integer part of the quotient and arrange it in positive order**

0.134->0010001001001101110

**Step3:Binary representation of 568.134**

1000111000. 0010001001001101110

**Step4: Move the decimal point to the left until the integer part is 1**

1000111000. 0010001001001101110->1.0001110000010001001001101110\*2^9

E=9+127=136->10001000

**Step5: Define the sign bit according to the sign of the value**

Value:0

**Step6: numerical assembly**

Sign bit S (1 bit, 0 is a positive number, 1 is a negative number) + exponent code E (8 bits) + mantissa M (23 bits)

0 10001000 00011100000100010010011

**Question 6 (20%):**

Let X, Y, Z denote the lowest three digits of your SID, and A, B, C denote the highest three digits of your SID. Please write the hexadecimal number of XYZ and ABC respectively, and calculate XYZ + ABC in hexadecimal ***directly*** (i.e., ***not*** do the calculation in decimal and then convert the result into hexadecimal). Please write down the calculation procedure.

**Step 1: Extract ABC and XYZ from SID**

Given the SID=56865134, you identify the following:

A, B, C are the highest three digits: ABC = 568

X, Y, Z are the lowest three digits: XYZ = 134

**Step 2: Convert to Hexadecimal**

Convert ABC and XYZ to their respective hexadecimal representations.

ABC (568 in decimal) is represented as 238 in hexadecimal.

XYZ (134 in decimal) is represented as 86 in hexadecimal.

Step 3: Perform Hexadecimal Addition

Add the hexadecimal representations of ABC and XYZ directly, without converting them back to decimal.

0x238+0x86=0x2BE