Lab Assignment 6
Bit Operations and Arrays

COL 100

19 April 2021

1 Find the output

Convert the numbers in their binary form and perform the arithmetic using 2's complement form (use an 8 bit representation)

1. 51 + 77
2. 53 – 112
3. 35 – 23
4. 87 + 12
5. -75 – 54

2 IEEE 754 Single-precision

Convert the following decimal representation into IEEE 754 Single-precision floating-point format. Verify your answers by using the printfloat.c program covered in the class. The program is available on the course web page

Example

```
0.085 = 00010101110000101000111101 1
      = 1.01011100001010001111011*2^-4

0: Sign
01111011: Exponent = -4 + 127(Bias)
01011100001010001111011: Mantissa
Output: 0 01111011 01011100001010001111011
```

Find output for:

1. 1
2. 12.375
3. -0.25

3 Count number of set bits:

Take an integer as input, count the number of bits which are 1 in the number. Output the count.

Example

Input:

```
5
```

Output:

```
2
```

Input:

```
-3
```

Output:

```
31
```

4 Hamming distance:

The Hamming distance between two integers is the number of positions at which the corresponding bits are different.

```
10 :   1 0 1 0
7  :   0 1 1 1
       1 1 x 1 => count = 3
```

Take two integers as input and print the hamming distance between them.

Example

Input:

```
1 4
```

Output:

```
2
```

Input:

```
11 18
```

Output:

```
3
```

5 Power of two:

Input a integer variable say K which is power of 2. Without using division or log operator find what is value of x for $2^x = K$.

Example

Input:

```
32
```

Output:

```
5
```

Input:

```
1024
```

Output:

```
10
```

6 Count frequency of an element:

Take as input size of an array, then take as many numbers as input. Input another variable say K, count the frequency of that in the array.

Example

Input:

```
8
1 2 1 6 5 4 1 2
1
```

Output:

```
3
```

7 Right-shift the array

Take as input size of an array, then take as many numbers as input. Take variable say K as input, print right-shifted array by K

Example

Input:

```
8
1 2 3 4 5 6 7 8
3
```

Output:

```
6 7 8 1 2 3 4 5
```

8 Swap position

Take as input size of an array, then take as many numbers as input. Swap smallest and the largest values(consider all values in array to be distinct) in array and print it:

Example

Input:

```
8
5 2 4 88 22 -3 0 -1
```

Output:

```
5 2 4 -3 22 88 0 -1
```

Submission and other logistics

Submit at least 5 solution (Q1, Q2 is compulsory; .c files of 3 other questions) as a zip file on Gradescope (to your respective group's course). Additionally, add screenshots in the same submission showing the execution of your code on your terminal with outputs for some given inputs. Submit only one .c file for each question. Use separate .c files for each new question. Please name your .c files as per the question number (q1.c, q2.c, ... etc). Following this naming convention will help TAs to figure out where to look the answers easily. You can also submit more than 5 or all questions to increase your chances of full marks.

Example: To zip folder 'a6' as 'a6.zip':

```
zip -r a6.zip a6
```

It is highly **recommended** that you name the code files and variables in those code files with proper names as per the question to easily identify them. Comments in your codes are also highly **recommended** and makes life easier for everyone.
You can check **2nd Chapter** in NASA's C style guide for styling recommendations.
You can work either individually or with another student of your group for the assignment.
only one submission on gradescope is enough for a team but you need to **add your teammate** on gradescope after submission.
Follow these steps for adding your team member
Note: you can change your team for future assignments