Department of Computer Science and Engineering

Assignment 6

Subject : Programming and Data Structure (CS19003)

Instructions:

- Give the name of the programs files as <Your roll>_<assignment number>_<question number>.c. For example, 21XX12345_A1_Q1.c for question 1 of assignment 1 of a student with roll 21XX12345. **Follow the file naming convention strictly**.
- Apart from the main .c file for each program, you should also upload one additional temporary .c file for each program (such as when you have finished half of the code). The naming for the temporary file should be in the format <Your roll>_<assignment number>_<question number>_temp.c. For example, 21XX12345_A1_Q1_temp.c **Make sure that your main code do not deviate much from its temporary code for each program**.
- You should upload the main .c file and the temporary .c file individually to the Moodle course web page once you finish answering each question. No need to zip the files.
- The **deadline** to upload the programs is 12:00PM. Beyond that, submission will be closed (No extensions will be granted).
- If you do not follow the instructions, your marks may be deducted.

[Total Marks = 100 (30 + 30 + 40)]

1. Consider the following recursive formula for calculating the n'th term of a series,

$$\mathbf{a}_n = 2 * (a_{n-1}) + 3 * (a_{n-2}), \qquad a_0 = 1, a_1 = 1$$

The first few terms of the sequence (starting from a0) is 1, 1, 5, 13, 41, 121.....Write a C program to input a number 'n' less than 20 and print the value of an . You must call a recursive function to calculate the value of an. Also in main(), you must keep a check that the input value of 'n' must be less than 20. If the input is greater than 20, then the program must display error 'Out of Range' and wait for the user to enter a valid input again. **[30]**

2. Take an integer array as input from the user. Write a recursive function to find the absolute difference of the consecutive two elements in that array from beginning to end of the array. To solve this problem, you need to write 2 functions: Function-1 computes the absolute difference between 2 numbers and returns the same. Function-2 is a recursive function which computes the successive differences between the elements of an array from beginning to end of an array. Function-2 uses the Function-1 for calculating the difference between 2 numbers, and it should take only the integer array and its size as input arguments.

Example:

Enter the number of elements of the array: 6

Enter a number: 12

Enter a number: 23

Enter a number: 34

Enter a number: 45

Enter a number: 56

Enter a number: 67

The absolute difference of 12 and 23 is: 11

The absolute difference of 23 and 34 is: 11

The absolute difference of 34 and 45 is: 11

The absolute difference of 45 and 56 is: 11

The absolute difference of 56 and 67 is: 11 **[30]**

3. Write a C program using recursive functions to compute the binary equivalent for a given decimal fractional number.

[**Hint:** In the first step, separate integer and decimal parts of a given decimal fractional number. For each part write a separate C recursive function. void int_to_bin(int, int[ ]), void frac_to_bin(int, int[ ]). Consider the max size of the array is 16 for storing the binary equivalents of integer and fractional parts. While printing the binary equivalent of a given decimal fractional number in the main(), only required portions of binary digits to be displayed.]

Example:

Enter a decimal number

13.625

integer part 13

decimal part 0.625000

Binary equivalent:

1101.101 **[40]**
