Daffodil International University
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Midterm Exam Examination, Summer 2021 @ DIU Blended Learning Center
Course Code: CSE214 (Day), Course Title: Algorithm
Level: 2   Term: 2   Section:
Instructor: Modality: Open Book Exam
Date: Thursday 8 July, 2021   Time: 01:30pm-4:00pm
Two and half hours (2:30), Marks: 25

Question: 1	**CO1:** Analyze and calculate **time complexity** and **space complexity** of various algorithms or any written code using mathematical formula and comparison of algorithms.	**[Marks: 5]**

a)   Suppose your ID is 193-15-12445, then **X will be 4 * 5 = 20**.   **[2.5]**

Count the number of primitive operations of each step. What is the **time complexity** of this segment and **justify** it?

```c
#include<stdio.h>
int main(){
    int i, j, k;

    for(i = 1 ; i <= X; i++){
        for(j = 1 ; j <= X² ; j++){
            printf("DIU CSE");
        }
    }

    for(k = 1; k <= X ; k++){
        printf("BLC");
    }
}
```

b)   Suppose, you are solving a problem through programming. Now, to solve that problem, you have two ideas of implementation. What are the **criteria** through which you can decide the best idea for solving the problem? Explain by giving an example.   **[2.5]**

Question: 2	CO2: Generate and interpret the **output** of **iterative** and **recursive** codes with the analysis of the problem definition.	[Marks: 5]

a)

```
#include <stdio.h>
void print(int ID, int count){
    if(ID < 0 || count == 2) return;
    printf("March Forward ID = %d\n",ID);
    print(ID%3,++count);
    printf("March Backward ID = %d\n",ID);
}
int main() {
    int ID;
    scanf("%d", &ID);
    // Value of ID is the last two digits value of your ID
    // For example if your ID is 191-15-1234 then ID = 34

    for(int i = 0, j = 10; i < j; i*=3,j-=4)   {
        print(ID,0);
        printf("ReCuRrEcUr\n");
    }
}
```

[2.5]

b)   Write an algorithm that will find all the **Common divisors** and also the **greatest common divisor** of two integers A and B where A is the **last two** digits of your ID and B is the **reverse order** of last two digits of your ID. For example, if your ID is 111-15-1050 then A = 50 and B= 05.

[2.5]

[N.B: C.D of 50 and 5 = 1, 5 and G.C.D of 50 and 5 = 5]

What will be the **time complexity** of your code?

Question: 3	CO3: Identify which algorithm listed under which algorithmic paradigm. **Compare** among various algorithms/implemented codes and choose the efficient one.	[Marks: 5]

a) Kajol recently lost her mobile phone and now she is in new market looking for a shop to buy a new phone. However, she does not know exactly where the shop is located and she feels shy to ask someone about it. She only knows the name of the shop. She is looking at the shop names and trying to find it out. Assuming there are n shops located one after another in the market. The shops are ordered by serial number not order by their names. Can you help Kajol to find out the shop she is looking for? Which method do you think would be more efficient for Kajol to find the shop? Explain. **[3]**

Do you think is there any way to optimize it by minimizing the overall searching time? If yes, explain how. If no, explain why?

b) ABC University has more than 20k students and a large number of teachers and admins. Their database is not well organized and also they have space limitations. So which algorithm is appropriate for this University to sort their data and why? Explain it briefly. **[2]**

Question: 4	CO4: Break down and describe the **simulation** of various algorithms for different input values.	[Marks: 10]

a) Take **last 2 part** of your name and find the **variable code** length of the characters of your name using **Huffman coding** algorithm. Then show the comparison ratio between fixed length and variable length codeword. If your name exceeds 12 characters then take up to first 12 characters, not more than that. **[6]**

[N.B: If last two part of Your name is "ANIK HASAN", then you will have to find the variable length codewords for these characters.]

b) Sorting is an integral part of Algorithm course. There are quite a few sorting algorithms such as bubble sort, quick sort, and merge sort. They are often quite interesting because of their different working methodologies and complexities. Now imagine you are asked to sort the digits of your own DIU student ID using **Merge sort** algorithm. Can you simulate the sorting process by mentioning necessary parameters in each step? **[4]**

[N.B: Your id is 201-15-1234 then your array will be {2,0,1,1,5,1,2,3,4,} which you need to sort.]