



Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Mid-term examination, Semester: Fall 2019

Course Code: CSE 221

Course Title: Algorithms

Total Marks: 25

Time: 1.5 hours

Answer all the questions precisely.

(The figure of the right margin indicates the full marks.)

1. Compute the time complexity of the following codes using **Big-O** notation:
- a) `#include<stdio.h>` 3
`main(){`
 `int i, j, k n;`
 `scanf("%d",&n);`
 `for(i=1; i<=n; i++){`
 `for(j=1; j<=n/2; j++){`
 `printf("DIU");`
 `}`
 `}`
 `for(k=1; k<=n; k++){`
 `printf("CSE");`
 `}`
}
- b) `#include<stdio.h>` 2
`main(){`
 `int i, n;`
 `scanf("%d",&n);`
 `for(i=1; i*i<=n; i++){`
 `printf("Algorithms");`
 `}`
}
2. a) Write a recursive function to implement Euclid's Greatest Common Divisor (GCD) 2.5
Algorithm.
- b) Write the output of the following recursive function call: 2.5
`#include<stdio.h>`
`int fun(int n){`
 `if(n>=20) return n;`
 `else`
 `return n+fun(n*2);`
 `}`
`main(){`
 `int c = fun(5);`
 `printf("C = %d",c);`
}

3. a) "Linear Search and Binary Search are well known searching algorithms and both of the algorithms follows **Divide and Conquer** approach."- Do you think the statement is valid? Justify your answer in no more than 3 sentences. 2
- b) Between Binary Search and Linear Search which one is better in terms of Time Complexity? 1
- c) Suppose you are the system architect of a software development team and you need a particular problem to be solved. **Zuckerberg** and **Steve** are two software engineers working in your team and each of them has written a correct solution for the problem. **Zuckerberg** 's solution runs in $O(N^3)$ while **Steve**'s solution runs in $O(2^N)$ for a large input size N . Which of the two solutions you will be accepting? Explain your reason in no more than 3 sentences. 2
4. Consider the following array:
arr[] = [3, 2, 1, 5, 4]
- a) Sort the given array using **Selection Sort** algorithm. [Show the simulation] 2.5
- b) Sort the given array using **Merge Sort** algorithm. [Show the simulation] 2.5
5. a) Suppose you have an unlimited supply of 1 taka, 5 taka and 10 taka notes. Please find a way to give someone 279 taka using the minimum number of notes. 2
- b) **Alibaba** has entered inside the mysterious cave with a knapsack of capacity 5 Kg. He found the following valuables in the cave! However, he has not found any way to break the items. 3

Item Name	Diamond	Gold	Emerald	Ruby
Weight (kg)	3	2	1	2
Price (in million BDT per kg)	8	3	7	6

Now your task is to apply a suitable algorithm to help him choosing items to maximize profit. What will be his maximum profit? What are the items to be taken?

-----The End-----