

International Islamic University Chittagong (IIUC)

Department of Computer and Communication Engineering

Mid-term Examination

Program: **B.Sc. (Engg.)**
Course Code: **CCE -2301**
Total Marks: **30**

Semester: **Spring 2023**
Course Title: **Data Structures and Algorithms**
Time: **1 Hours 30 Minutes**
Date: **25/02/2023**

- (i) Answer all the questions. The figures in the right-hand margin indicate full marks.
(ii) Course Learning Outcomes (CLOs) and Bloom's Levels are mentioned in additional Columns.

Course Learning Outcomes (CLOs) of the Questions

- CLO1** Identify various terminologies of data structures and algorithms.
CLO2 Implement various data structures such as arrays, records, pointers, stacks, queues, recursions, linked lists, trees and graphs.
CLO3 Analyze and compare various searching and sorting techniques.

Bloom's Levels of the Questions

Letter Symbols	R	U	Ap	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

- Q1.** a) What is an algorithm? How it differs from a program. **CLO1** R, An 3
b) Explain Asymptotic Notation. Arrange the growth rate of 2^n , n^2 , 1, $\log n$, $n \log n$, 3^n , and n in increasing order of growth. **CLO1** U, An 4
c) Find out time complexity for the following pseudo code using **O-notation** **CLO1** Ap 3

```
for(i=0;i<n;i++)  
{  
    for(j=1;j<n;j=j*2)  
    {  
        //Code.....  
    }  
}
```

- Q2.** a) Write an algorithm for **PUSH** operation of stack and Using figure given below, illustrate the result of each operation in the sequence **CLO2** C 6
PUSH (S, 4), PUSH (S, 6), PUSH (S, 8), PUSH (S, 12), POP (S), PUSH (S, 15), and POP(S) on a partially filled stack **S** stored in array **S (1...5)**.

	1	2	3	4	5
S	5	10			

S.top = 2

Discuss stack overflow and underflow conditions (if occurs) with respect to above operations.

- b) Transform following expression to prefix using stack **CLO2** Ap 4
 $(A - B / C) * (A / K - L)$

- Q3. a)** Explain the concept of a **circular queue**? How is it better than a linear queue? **CLO2 U, An 4**
- b)** Write an algorithm to perform each operation on a circular queue **CLO2 C 6**
- I. Insert an element in a circular queue and*
- II. Delete an element from the circular queue.*

OR

- Q3. a)** Discuss **priority queue** with its array representation? Give its applications. **CLO2 U 4**
- b)** Consider the queue given below which has **FRONT = 1** and **REAR = 5**. **CLO2 Ap 6**

	A	B	C	D	E				
--	---	---	---	---	---	--	--	--	--

Now perform the following operations on the queue with a neat graphical representation:

- I. Add F*
- II. Delete two letters*
- III. Add G*
- IV. Add H*
- V. Delete four letters*
- VI. Add I*

***** Good Luck *****