Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

2nd Year 1st Semester Final B.Sc. Engineering Examination-2021

Course Code: CSE201 **Course Title: Data Structure**

Total Marks: 60 **Time: 3 (Three) Hours**

N.B.:

i. Answer **SIX** questions taking any **THREE** from each section.

ii. All parts of a question must be answered sequentially.

Section-A

1. a) Define Data Structure. Why do we need to know about different types of data structures in the computer engineering field? **1+2**

b) "All the logics behind control structures could be used in a single solution with their usual characteristics." Do you agree? Defend yourself using an example. **2**

c) Write down an algorithm for searching an element in an unsorted array. Deduce number of comparisons required in the best, worst and average cases. **1+2**

d) What do you mean by the complexity of an algorithm? Discuss briefly the time-space tradeoff of algorithms. **2**

2. a) Let array A: 32, 66, 51, 27, 85, 23, 13. Apply bubble sort algorithm to sort the array. **3**

b) What is binary tree? Construct a binary search tree for the following numbers: **3**

40, 60, 55, 22, 66, 11, 50

c) Derive the complexity of linear search algorithm. **2**

d) Write down the differences between Breadth-First-Search (BFS) and Depth-First-Search (DFS) with a suitable example. **2**

3. a) Distinguish between stack and queue. **2**

b) Convert the following postfix expression into its equivalent infix expression and then evaluate it: **3+2**

12, 7, 3, −, /, 2, 1, 5, +, *, +

c) Consider the following queue where QUEUE is allocated 6 memory cells: **3**

FRONT=2, REAR=4 QUEUE: __, A, C, D__, __

Describe the queue including FRONT and REAR, as the following operations take place:

i. K, L, M are added to the queue

ii. Two letters are deleted and

iii. R is added to the queue

4. a) What are the advantages of linked list over array? **2**

b) Write algorithms for PUSH and POP operations of stack using array. **3**

c) What is chaining? How does it help in hashing? Give example. **3**

d) Write a program to generate Fibonacci series using recursion. **2**

Section-B

5. a) What is linked list? Describe the representation of linked list in memory. **3**

b) Write down the algorithm of searching a linked list when the list is unsorted. **3**

c) What are the applications of data structures? Give examples. **4**

6. a) Define queue. **1**

b) Construct an expression tree for the expression: E = (x + y – z) / (5a * 3b / 6c). **3**

c) Build a heap from the following list of numbers: 40, 30, 70, 23, 54, 50, 21, 44, 55, 77. **3**

d) Consider the following list of numbers: 23, 14, 10, 17, 24, 11, 18, 10, 32, 14, 6, 22, 15, 25. Using binary search tree, delete the duplicate numbers and find the exact number of comparisons. **3**

7. a) Consider the following list of letters is inserted into an empty binary search tree: **4+3**
J, R, D, G, T, E, M, H, P, A, F, Q

i. Find the final tree T (show each step separately) and

ii. Describe the tree after the node R is deleted

b) Suppose inorder and preorder traversals of a binary tree are as follows: **3**
Inorder: D B H E A I F J C G
Preorder: A B D E H C F I J G
Draw the binary tree.

8. a) What is connected graph? Describe the linked representation of graph. **1+2**

b) Suppose S is the following list of 14 alphabetic characters: D A T A S T R U C T U R E S. **3**
Use the Quick sort algorithm to find the final position of character E.

c) What is graph? Discuss about the shortest path algorithm with example. **4**