UG 2nd - Semester Examination - 2025 (Under NCCF)

Award	**:**	**B. Sc.**
Discipline	**:**	**Computer Science**
Course Type	**:**	**MNC-2 (Minor)**
Course Name	**:**	**Data Structures and Algorithms**
Course Code	**:**	**BSCCOSMN201**
Full Marks	**:**	**35** **Time: 2 Hours**

(The figures in the right-hand margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable. Notations and symbols have their usual meaning.)

1. Answer any *five* of the following questions. **1X5=5**

a) What is a self-referential structure? Give an example.
b) What is meant by a stable sorting algorithm?
c) Why tree is called a non-linear data structure?
d) What do you mean by recursive algorithm?
e) Write two applications of stack.
f) What is the full form of FIFO and which data structure follow this method?
g) Give an example of Adjacency list in representing Graph.
h) What do you mean by out-degree of a node in a graph?

2. Answer any *five* of the following questions. **2X5=10**

a) What is the time complexity of bubble sort in the best and worst case?
b) Compare and contrast between singly linked list and doubly linked list.
c) Can we perform a binary search if the numbers (already sorted) are stored in Linked List? Justify your answer.
d) Create a binary search tree using the following data elements
45,39,56,12,34,78,89,54,67,81
e) Convert the Infix expression $A - B - D * E/F + B * C$ into Prefix.
f) What do you mean by divide and conquer technique?
g) What is a priority queue? Which data structure is suitable for implementing a priority queue?
h) What do you mean by threaded binary tree?

3. **Answer any *two* of the following questions.** **5X2=10**

a) Write a C function to reverse the directions of links in singly linked list.

b) Construct a binary tree given the pre-order traversal and in-order traversal as follows:
Pre-Order Traversal: G B Q A C K F P D E R H
In-Order Traversal: Q B K C F A G P E D H R
Show the post-order traversal of the constructed tree. 4+1

c) Consider the queue given below which has FRONT = 1 and REAR = 5.

	A	**B**	**C**	**D**	**E**				

Now perform the following operations on the queue:

(i) Add F

(ii) Delete two letters

(iii) Add G,H

(iv) Delete four letters

(v) Add I

Show every step with value of FRONT and REAR.

d) Using selection sort algorithm arrange the following elements in ascending order:

3 7 1 10 15 5 2 6

4. **Answer any *one* of the following questions.** **10X1=10**

a) i) Convert the expression given below into its corresponding postfix expression and then evaluate it using stack.

8*2^3 + ((7 – 5) + 8)/2 (^ denote exponential operator)

ii) Write an algorithm for binary search. Find the time complexity of binary search. Find the time complexity of insertion sort if binary search technique is used. (2+3)+(3+1+1)

b) What is the maximum possible height of an AVL tree with 7 nodes? Insert 6, 12, 7, 3, 5, 15, 10, 4 (in the given order) into an initially empty AVL tree. Then delete 15, 7, 6 and 4 from it. Show all intermediate steps. 2+4+4

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