

National Institute of Technology, Hamirpur B.Tech. End Semester Examination – 2023

Subject Name: Data Structure Subject Code: MA-223 Branch: Mathematics and Computing Semester: 4th Total Marks: 50 Time: 3 Hours

All questions are compulsory.

1. (i) Explain the following terms briefly:

a) Data Structures, b) Hashing (2+2) (ii) Apply Quicksort algorithm on the given elements and show all the passes:

(iii) Solve the following recurrence relation:

T(n) = T(n-1) + 1

with initial condition as T(0)=0

2. (i) Write a program which uses functions to perform the following operations on single linked list:

a) Insertion, b) Deletion. (2+2)

(ii) What are Linked Queues? Give pictorial representation. (3)

(iii) Explain linked representation of stack along with schematic diagrams. Also write the algorithm of PUSH and POP operations. (3+3)

3. (i) Construct a Binary Search Tree (BST) for the following sequence of (2)

45, 32, 90, 34, 68, 72, 15, 24, 30, 66, 11, 50, 10.

Also write its Preorder, Postorder and Inorder traversal.(3)(ii) Illustrate the steps for converting an Infix expression into a Postfixexpression for the following expression:

$$x^{y}(5*z)+2$$
 (2)

P.T.O

(2)

(iii) Insert the following keys in the order shown to construct an AVL search tree.

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 $D, E, F, G, H, C, B, A \tag{4}$

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4. (i) Deduce a minimum spanning tree for the following graph (Figure 1) using Kruskal's algorithm: (4)
(ii) Consider the graph (Figure 2) below and solve the single source

shortest path problem (source=A) using Dijkstra's algorithm. (4)

5. (i) Consider the given weighted graph G (Figure 3). Suppose the nodes are stored in memory in an array DATA as follows.

DATA: A, B, C, D

Find the matrix Q of shortest paths using Warshall's Algorithm.(4)(ii) Explain about Prim's algorithm in detail with example.(4)

