

R22

Code No: 183AM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, February - 2024

DATA STRUCTURES

(Common to CSE(AI&ML), CSE(IOT), AI&DS, AI&ML)

Time: 3 Hours

Max. Marks: 60

Note: This question paper contains two parts A and B.

i) Part- A for 10 marks, ii) Part - B for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of ten questions (numbered from 2 to 11) carrying 10 marks each. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.

PART- A

(10 Marks)

- 1.a) Define a single linked list? [1]
- b) What are the applications of the queue? [1]
- c) Define Rehashing? [1]
- d) What is a skip list? [1]
- e) Define Binary search tree? [1]
- f) What is the need of rotations in red-black tree? [1]
- g) List out the external sorting techniques. [1]
- h) Define a graph. [1]
- i) Define a trie. [1]
- j) List out the applications of tries. [1]

PART-B

(50 Marks)

- 2.a) Write an algorithm for Insertion and Deletion operations in a Singly Linked List.
  - b) Explain Push and Pop operations of a stack using array representations. [5+5]
- OR
- 3.a) The following numbers 10, 20, 50, 30, 90, 60 (Top) are present in a stack of size 10. Perform the following operations in sequence. pop(), push(30), push(40), pop(), push (60), pop(), pop(), pop() What is the peek element at last? Draw and explain it?
  - b) Convert the following infix expression into postfix expression:  
 $A + B - C * D * E / F - G.$  [5+5]

- 4.a) What is a Dictionary?
- b) Write an algorithm for insertion and deletion operations of a skip list. [5+5]

OR

- 5.a) Insert the following list of elements into the hash table by using Quadratic probing (size of Hash table is 13: 65, 34, 79, 114, 26, 85, 55, 89, 22, 98.
- b) Explain briefly about double hashing and extendible hashing techniques. [4+6]

- 6.a) Write an algorithm to delete an element from the binary search tree and provide an example.
- b) In an initially empty AVL tree insert the following keys: DEC, JAN, APR, MAR, JUL, AUG, OCT, FEB, NOV. Draw AVL tree after every insertion and apply rotations wherever is necessary? [5+5]

**OR**

- 7.a) Discuss the importance of height balanced trees for searching.
- b) Insert the following list of elements from the Red- Black tree 12, 30, 36, 18, 25, 9, 4, 2, 17, 14, 20, 47. Delete the elements 18, 2 and 30 from the Red-Black tree and draw the final tree diagram. [5+5]

- 8.a) Consider five cities: (i) New Delhi, (ii) Mumbai, (iii) Chennai, (iv) Bangalore, and (v) Kolkata, and a list of flights that connect these cities as shown in the following table. Use the given information to construct a graph? Also represent the graph using adjacency matrix and adjacency list

Flight No	Origin	Destination
101	2	3
102	3	2
103	5	3
104	3	4
105	2	5
106	5	2
107	5	1
108	1	4
109	5	4
110	4	5

- b) Write and explain depth-first search traversal algorithm with an example. [5+5]

**OR**

- 9.a) Write and perform heap sort algorithm for (10 15 6 2 25 18 16 2 20 4) .
- b) Explain BFS algorithm with example. [5+5]

- 10.a) Write an algorithm of Standard Trie.
- b) Solve the Knuth Morris-Pratt algorithm for the following:  
 Example: Text: HEREISASIMPLEEXAMPLE  
 Pattern: EXAMPLE. [5+5]

**OR**

- 11.a) “A compressed trie is an advanced version of the standard trie.” Support or oppose this statement with necessary explanation.
- b) Explain the features that distinguish between Boyer Moore algorithm from the conventional algorithms. [5+5]

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