U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 20CS5PEADS **Max Marks: 100**
Course: Advanced Data Structures

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Show the result after performing the following sequence of instructions: union (1,2), union(3,4), union(3,5), union(1,7), union(3,6), union(8,9), union(1,8), union(3,10),union (3,11), union(3,12), union(3,13), union(14,15), union(16,0), union(14,16),union (1,3), union(1, 14) when the unions are performed by height. **6**

b) Show that if unions are performed by height, then the depth of any tree is O(logN). **4**

c) There are n cities. Some of them are connected, while some are not. If city 'A' is connected directly with city 'B', and city 'B' is connected directly with city 'C', then city 'A' is connected indirectly with city 'C'. A province is a group of directly or indirectly connected cities and no other cities outside of the group. **10**

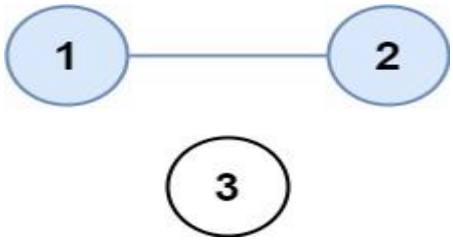
You are given an n x n matrix: isConnected

Where

isConnected[i][j] = 1 if the i^{th} city and the j^{th} city are directly connected.

isConnected[i][j] = 0 otherwise.

Example:



Input: isConnected = [[1,1,0], [1,1,0], [0,0,1]]

Output: 2

Write a C/C++ program to return *the total number of provinces using disjoint **sets.***

OR

2 a) Compare move to front method and transpose method of self-organizing list and analyze which method gives better results. **6**

b) Construct unrolled linked list for the following numbers with capacity 5 **5**
1,2,3,4,5,6,7,8,9,10
Analyze and justify how unrolled linked list is better than linked list.

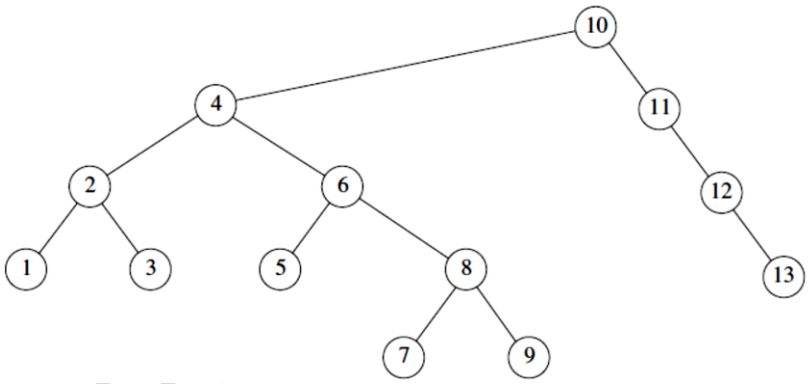
c) Starting with an empty Skip list with MAXLEVEL 4, Demonstrate inserting the following keys into the skip list: **9**
i) 5 with level 1, 26 with level 1, 25 with level 4, 6 with level 3, 21 with level 1, 3 with level 2, 22 with level 2.
ii) Delete key 6 from the skip list.

UNIT - II

3 a) Construct AVL tree for the following sequence of numbers: **8**
1,2,3,4,5,6,7,16, and 15.

b) List the properties of B trees. **4**

c) Show the result of accessing the key 5 in the following splay tree. Analyze how splay tree is better in practical situation. **8**

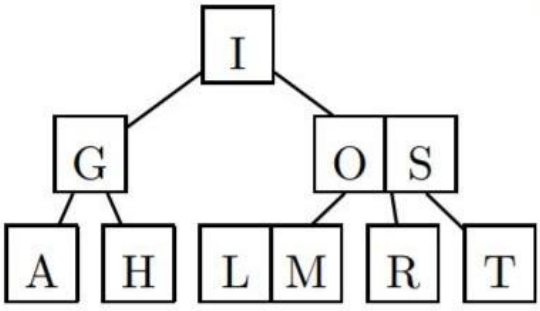


OR

4 a) Demonstrate any four cases of deletion procedure in Red-Black trees with examples. **6**

b) Show that every AVL tree can be colored as a Red-Black tree. Are all Red-Black trees AVL? Justify your answer. **4**

c) Construct the 2-3 tree after deletion of the letters: '**A', 'L', 'G',** and **'O'** from the following 2-3 tree. Show the steps clearly. **10**



UNIT - III

5 a) Construct a Fenwick tree for the following array {5 , -4 , -5 , 1 , 2 , 4 ,3 ,1 , 2 , -5 }.Also show how the sum from 0 to 8 is computed. **10**

b) Construct a trie for the strings "tree", "trie", "algo", "assoc", "all", and "also. Analyse and compare the efficiency of tries and suffix tree. **10**

UNIT - IV

6 a) Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function $h(x) = x \bmod 10$ and table size m=10. show the resulting **8**

i. Hash table using Linear probing.

ii. Hash table using Quadratic probing.

b) Construct a Hash table for the following numbers: **12**

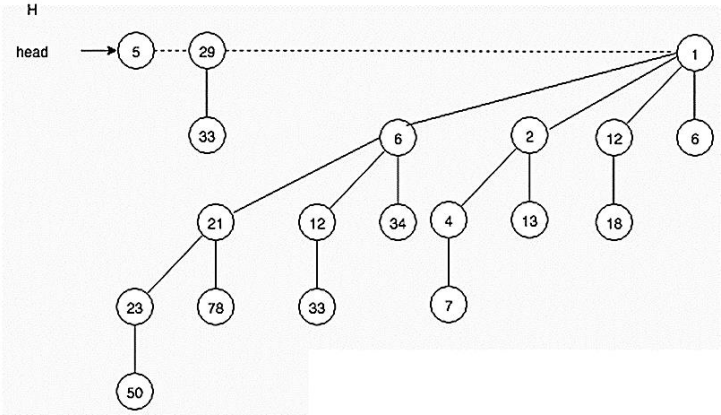
9, 14, 18, 76, 27, 65, 34, 51, 46, 83, 94, 44, 112, 71, 31

Show how collision is resolved using Extendible Hashing with each step demonstrated clearly. Also, mention how directory expansion and bucket splitting happens. consider Bucket limit=3.

UNIT - V

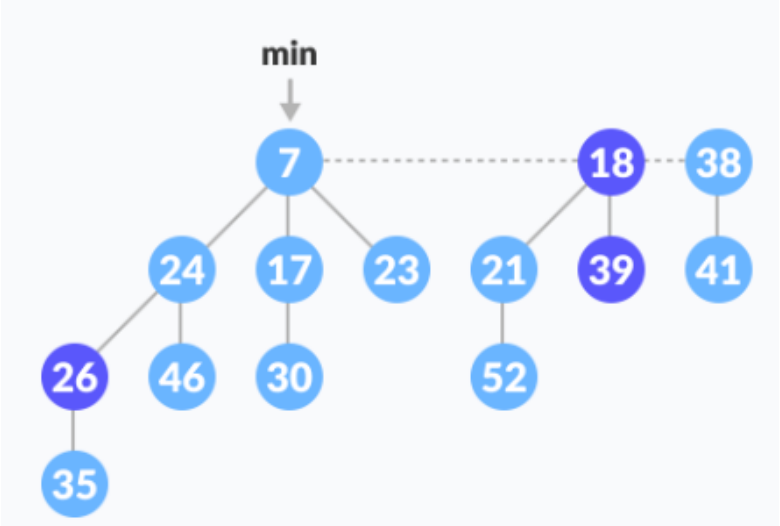
7 a) Discuss the properties of Binomial Tree. **4**

b) Demonstrate how minimum node is extracted from the following Binominal heap. **8**



c) For the below Fibonacci Heap, show how the value 46 and 35 are decreased to values 15 and 5 respectively. Show all the steps clearly. **8**

Note: Marked nodes - 26,18,39.



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