INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, SRI CITY

TERM-II EXAMINATION – SPRING 2024

Subject Name: ADSA

CSE:UG2(PC)

Duration: 90 Mins (3:30-5:00 PM)

Date: 17-10-2024
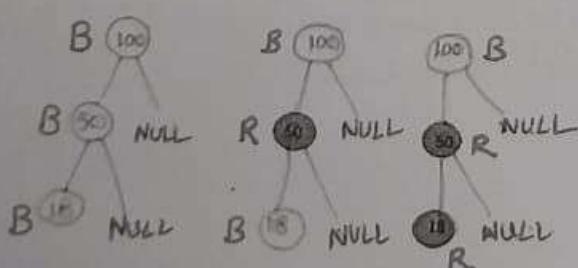
Max. Marks: 25

Instructions:

Roll No: 520230010208

1. All questions are compulsory.
2. Write the answers legibly.
3. Write Objective Type Questions Answers also in the Answer Sheet
4. Electronic Gadgets like mobile phones, laptops, smartwatches are not allowed.
5. Scientific Calculator is allowed

Section-A (Objective Type Questions)

| 1	A B-tree of order 4 and of height 3 will have a maximum of _____ keys.	[1 Mark]
	ⓐ 255 b. 63 c. 127 d. 188	
2	A B-tree of order 4 is built from scratch by 10 successive insertions. What is the maximum number of node splitting operations that may take place? ⓐ 3 b. 4 c. 5 d. 6	[1 Mark]
3	When it would be optimal to prefer Red-black trees over AVL trees? ⓐ when there are more insertions or deletions b. when more search is needed c. when tree must be balanced d. when log(nodes) time complexity is needed	[1 Mark]
4	Consider the below formations of red-black tree. B : Black Node R : Red Node.	[1 Mark]
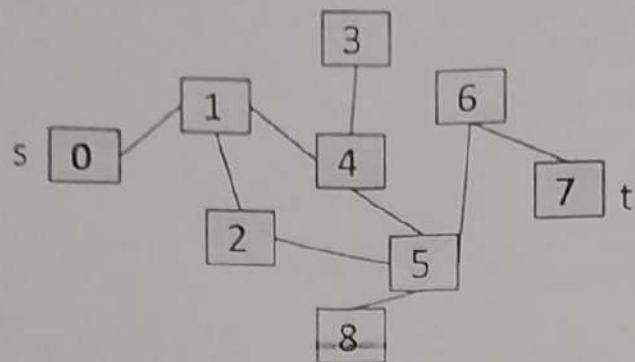
All the above formations are incorrect for it to be a red-black tree. Then what may be the correct order?
a. 50-black root, 18-red left subtree, 100-red right subtree
b. 50-red root, 18-red left subtree, 100-red right subtree
c. 50-black root, 18-black left subtree, 100-red right subtree
d. 50-black root, 18-red left subtree, 100-black right subtree

5	The Data structure used in implementation of Depth First Search is? a) Stack b) Queue c) Linked List d) Tree	[1 Mark]
6	What is the time complexity of both BFS and DFS in terms of the number of vertices V and edges E A) $O(V+E)$ B) $O(V^2)$ C) $O(E)$ D) $O(V\log V)$	[1 Mark]
7	Which algorithm would you typically use to find the shortest path in an unweighted graph? A) DFS B) BFS C) Both of the Above D) None of the Above	[1 Mark]
8	What can be the maximum depth of the trie with n strings and m as the maximum string length? a) log2n b) log2m c) n d) m	[1 Mark]
9	A B+ tree can contain a maximum of 7 pointers in a node. What is the minimum number of keys in leaves? a) 6 b) 3 c) 4 d) 7	[1 Mark]
10	Which of the following is not true? a) Trie requires less storage space than hashing b) Trie allows listing of all the words with same prefix c) Tries are collision free d) Trie is also known as prefix tree	[1 Mark]

Section-B (Subjective Type Questions)

1.	a. Insert the following keys in the red-black tree 9,17,6,14,15,29,24,39,59,1	[3 Marks]
	b. Delete the following keys from the above constructed red-black tree 9,17,6,14	[2 Marks]

2   **[5 Marks]**
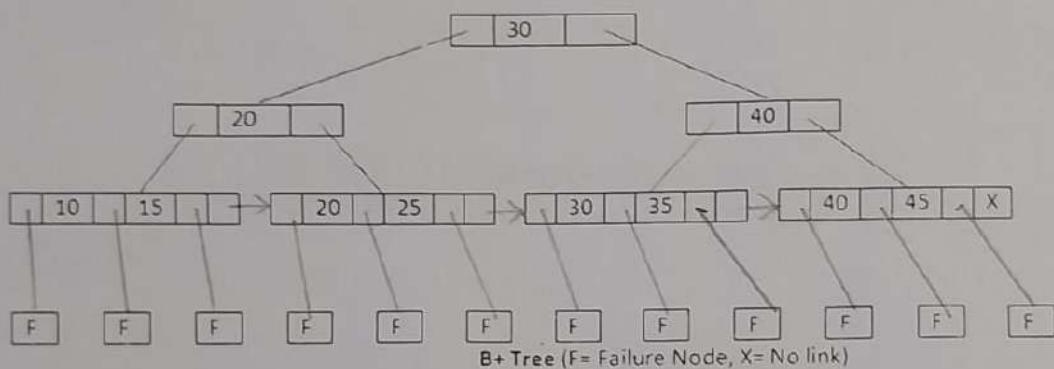

Consider this graph, where *S* represents the start node. What will be the order in which the vertices will be visited using **DFS** (Depth first Search). Maintain the record of the parent node and create the final DFS Tree. Create a neat and clean graph/tree mentioning each step clearly. If we can't understand it we can't grade it.

3   Consider the following B+ tree of order 3.   **[5 Marks]**

B+ Tree (F= Failure Node, X= No link)

Insert 16, 36, 46 into the above B+ tree and delete 20 from the resultant B+ tree. Draw the trees step-by-step neatly.