S7 – DS

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(Autonomous College of Affiliated to University of Mumbai)

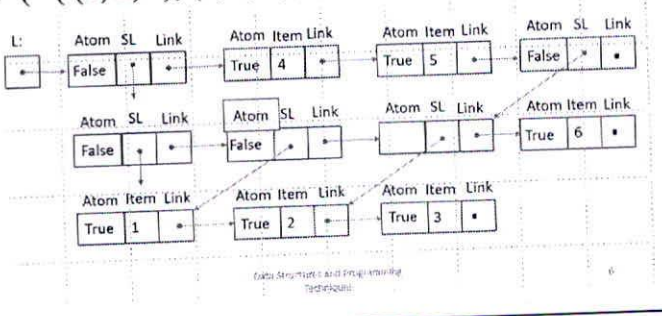
End Semester Examination

December 2022

Maxi Marks : 100
Class : S.E.
Course code: CS202
Name of the course : Data Structures

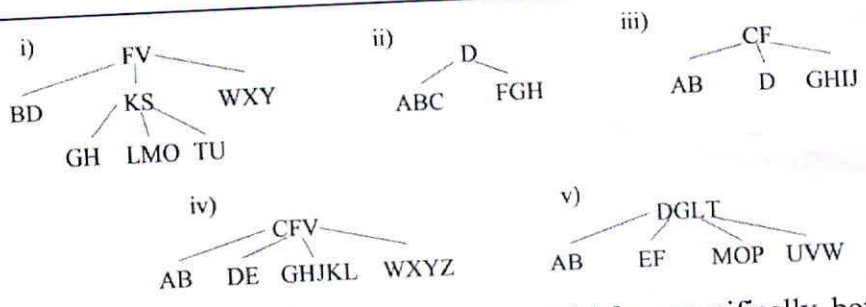
Synoptic

Duration : 3 hours
Semester : III
ranch :COMP/DS/AIML

Q No		Max Marks
Q1 a	Evaluate the following postfix expression using Stack diagrammatically. 4 3 – 3 8 2 / + * 2 $ 3 + **Correct evaluation - 05 Marks**	**05**
Q1b	Compare Priority Queue and Circular Queue. Explain Josephus' Problem. **Comparison - 02 Marks Josephs problem - 03 Marks**	**05**
Q1c	Write a function to remove duplicates from ascending order sorted linked list **Correct code - 04 Marks Diagram - 01 Marks** **OR** Given a linked list, write a function to remove the nth node from the end of list and return its head. For example, Given linked list: 1->2->3->4->5, and n = 2. After removing the second node from the end, the linked list becomes 1->2->3->5. Note: If n is greater than the size of the list, remove the first node of the list. **Correct code - 04 Marks Diagram - 01 Marks**	**05**
Q1 d	What is a Generalized linked list? ------**02 Marks** Represent the following list using GLL with shared sublist. Draw a supportive diagram. **06 Marks** Give sample declaration in C language of Generalized linked list given below. **- 02 Marks** **L=(((1, 2, 3), (1, 2, 3), (2, 3), 6) , 4, 5, ((2, 3), 6) .** 	**10**

[PTO]

Q2 a	Construct a Binary tree from given Inorder and postorder sequence.Show intermediate steps. in[] = {4, 8, 2, 5, 1, 6, 3, 7} post[] = {8, 4, 5, 2, 6, 7, 3, 1} **for each step - 01 Mark (Total -04) and final correct tree - 01 Mark**	5
Q2 b	Given a Binary Search Tree(BST) and a positive number k, write a program to find the k^{th} largest node in the BST. Assume the tree is already created. **Note:Use c/c++/java. The logic of Inorder Traversal should not be used for the above function logic implementation.** Logic expected to use is: 1- locate maximum using Find Max procedure by going in right subtree in rightmost.----------**4 marks** 2- if K>1 , then delete k-1 max no. from BST by using Deletion procedure in BST----------**4 marks** 3- return kth largest 4- main function and function calls with loop ----**2 marks** **OR** Write a program to create a Binary search tree and also find an inorder predecessor of a given node. **Note: Use c/c++/java. The logic of Inorder Traversal should not be used to find predecessor.** 1. **creation of bst — 4 mark** 2. **find predecessor – 4 mark** 3. **structure and main() – 2 mark**	**10**
Q3a	Which of the following are legal B-trees for when the minimum branching factor(minimum subtrees) is 3? Write the order of B Tree resulted. For each B tree given below determine whether it is legal or not. For those which are not legal,specify the propert violated.	**10**



(i): Not legal since the height is not balanced. More specifically, both the node with "BD"
and "KS" are at the same level but "BD" is a leaf and "KS" is not.
(ii): This is legal. Remember, that the root can have just a single key.
(iii): Not legal – the key "D" has less than the minimum allowable size of 2 keys.
(iv): This is legal.
(v): Not legal – there's no leaf node corresponding to the keys between G and L.
Each correct answer with justification———-2 mark

OR

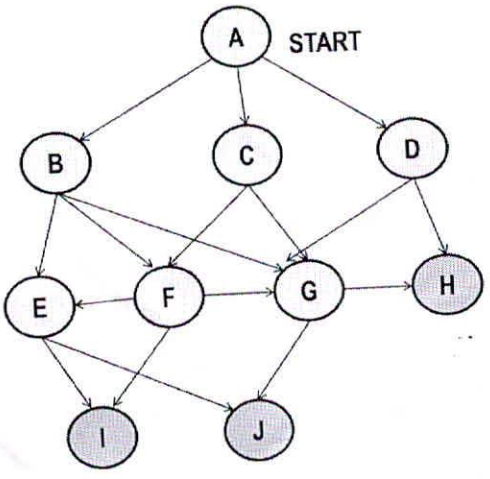
i- State the properties of B tree————————**4 marks**

ii-Construct a B Tree of order-4 by inserting the data given below in the same sequence. Show the steps after each insertion. (Note: subtree should be left heavy after splitting)

1, 4, 7, 10, 17, 21, 31, 25, 19, 20, 28, 42.

————————4 splits at insertion of ———-2 each correct split= 1.5*4=6

Q3b	Construct an AVL tree for the given data where nodes are inserted in the following order.Explain all the applicable rotations during insertion. 3, 2, 1, 4, 5, 6, 7, 16, 15, 14 **After each applicable balancing rotation - 06 marks** After construction of an AVL tree, perform following delete operations in the given sequence: i. Delete node 7 ii. Delete node 4 **For each correct deletion - 02 Marks (total - 04)**	**10**
Q4a	Write properties of Binary heap data structure ? Show with example how the Max-heap data structure can be used to find k^{th} largest element ? **properties - 04 Marks kth largest correct explanation and example - 06 Marks**	**10**

Q4b	What is Fibonacci heap data structure ? Explain Decrease key operation with example. Example should include all cases **What is Fib. heap - 04 Marks Decrease key algorithm with All cases - 06**	**10**
Q5 a	 fig 1. 1. Represent the graph in Fig. 1. using an adjacency List. **– 02 Marks** 2. Draw the BFS and DFS traversal for the graph in fig. 1.Assume the starting node is 'A'. Nodes should be visited in ascending order only. **BFS - 03 Marks DFS - 03 Marks** 3. Show Connected components found in DFS traversal. **Connected Components - 02**	**02** **06** **02**
Q5 b-i	The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function h(k) = k mod 10 and linear probing. Draw the resultant hash table after insertion **for each collision handling with calculations - 01 Mark (1 * 5 = 5 Marks)**	**05**
b-ii	What is a collision? State different collision resolution techniques. Explain the separate chaining. **what is collision ? different techniques with example - 02 marks** **separate chaining —– 03 Marks**	**05**