Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous College Affiliated to University of Mumbai)

Re-Examination
Nov 2022

Max. Marks: 60 **Duration: 120 min.** **Class: S.E.**

Semester: III **Course Code: CS/IT 202** **Branch: IT/COMP**

Name of the Course: Data Structures

Instructions:
(1) All Questions are Compulsory
(2) Draw neat diagrams
(3) Assume suitable data if necessary

Q. No.	Question	Max Mks	CO-BL-PI
Q1 (a)	Write a function to perform the following operations on a doubly linked list: i) insert at a specific location into the list ii) delete the given data from the list **OR** Write a function to perform the following operations on Circular Singly linked list: i) insert after the given element into the list ii) delete the given element from the list	*06*	*1-3-1.4.1*
Q1 (b)	Construct a Binary tree, using INORDER and POSTORDER traversal sequence given below:- Inorder: RQONPSZ Postorder: RONQSZP	*04*	*2-3-4.1.2*
Q2 (a)	i. Convert the following expression into a postfix using Stack. Show the status of the stack. (f - g) * ((a + b) * (c - d)) / e ii. Represent the following polynomial expression using Generalized Linked List and explain the GLL node's basic structure. $6x^4y^2z^3+4x^2yz^2+3xyz+56$	*03* *03*	*2-3-4.1.2*
Q2 (b)	i) Construct an AVL tree, where nodes are inserted in the following order. Mention the type of rotation when applied. Show the balance factor of each node after insertion. 10, 20, 15, 25, 30, 16, 18, 19. ii) Perform Deletion of node 15 and node 25 on the above-constructed AVL tree	*04* *02*	*2-3-4.1.2*

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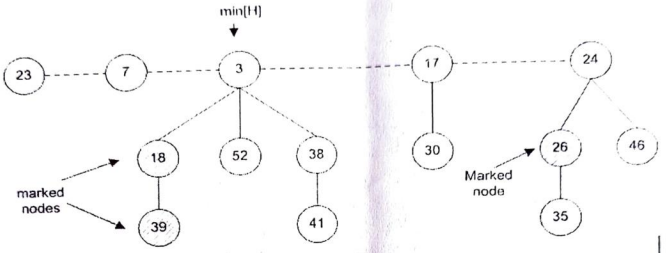
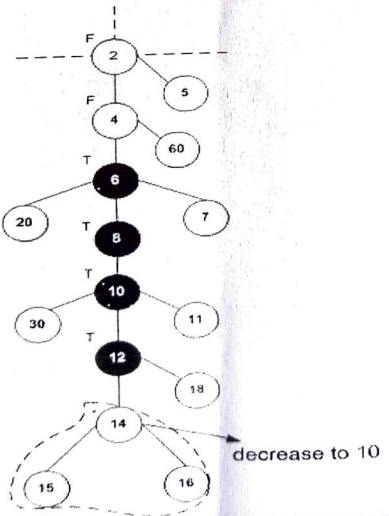
Q3 (a)	i)Construct a B-Tree of order-4 by inserting the data below in the same sequence. Show the steps of each insertion. (Note: subtree should be left heavy after splitting) 5, 3, 21, 9, 1, 13, 2, 7, 10, 12, 4, 8. ii) On the resulting B-tree after insertion of all above given keys, Perform Deletion of the following keys in the given sequence: 9 and 12	*04* *02*	*2-3-4.1.2*
Q3 (b)	Construct a Binary Search Tree by inserting the data in the given order: 12, 15, 3, 35, 21, 42, 14, 11 and then delete the data 15 and 12 from the binary search tree. **OR** Given a Binary Search Tree(BST) and a positive number k=2, write a function to find the kth largest node in the BST. Assume the tree is already created. **Note: The logic of Inorder Traversal should not be used for the above function logic impiementation.**	*06*	*2-3-4.1.2*
Q4 (a)	Apply the heap sort procedure to sort the given array and show the intermediate steps for only the sorting procedure. A={ 5, 13, 2, 25, 7, 17, 20, 8, 4}	*06*	*3-3-1.4.1*
Q4 (b)	Given the values {2341, 4234, 2839, 430, 22, 397, 3920}, a hash table of size 7, and hash function h(x) = x mod 7, show the resulting tables after inserting the values in the given order with each of the following collision strategies. 1- Separate chaining 2- Double hashing with second hash function h'(x) = (2x - 1) mod 7	*03* *03*	*4-3-4.1.2*

Q5(a)	a- Calculate the potential function for the given Fibonacci heap	02	3-3-1.4.1
	b- Insert node with key value 21 in the given Fibonacci heap. show the updated Fibonacci heap	02	
	c- Extract the Minimum node from the updated Fibonacci heap resulting from question 5.b. Show updated heap at each step	04	

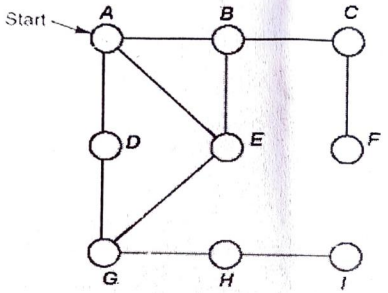


OR

Perform Decrease Key operation on the given Fibonacci heap, consider darkened nodes are marked nodes. Decrease the key of a node with keys 14 to 10. Show the updated Fibonacci heap at every step and write the applied rule/ justification at each stage. 08



P. T. O.

Q5(b)	Consider the Graph given below 1- Suggest a suitable graph traversal algorithm to get the shortest distance to reach to every other city in the graph starting from city 'A' 2- Apply the suggested traversal algorithm on the given graph with city 'A' as starting node and show the status of the data structure used at every step. Policy: Assume the procedure considers increasing order of cities and also 3- After applying the suggested graph traversal algorithm, draw the resulting tree starting from city 'A'.  	*01* *04* *01*	*2-3-1.4.1*