Sardar Patel Institute of Technology

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ES

(Autonomous College of Affiliated to University of Mumbai)

End Semester Examination

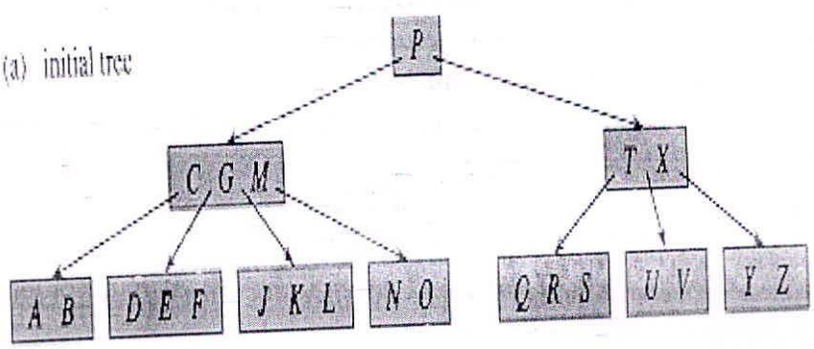
December 2022

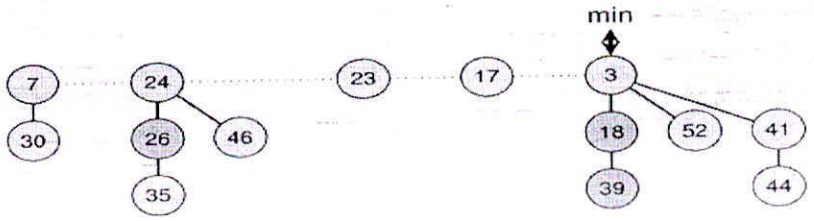
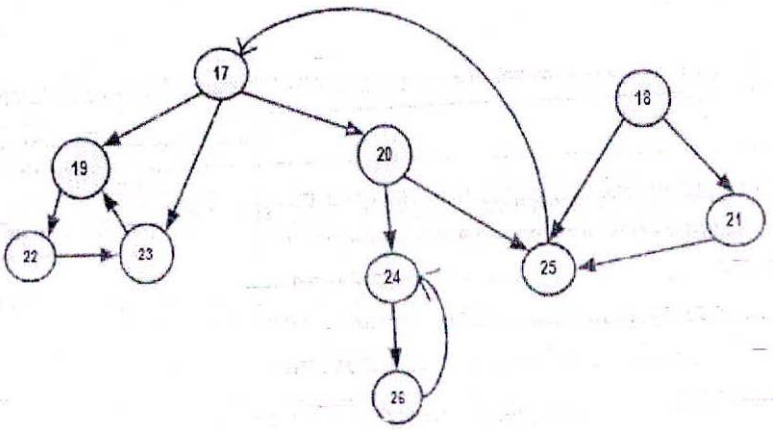
Maxi Marks : 100
Class : S.E
Course code: CE202
Name of the course : Data Structures

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

Q No		Max Marks	CO	BL
Q1	1. Compare Stack and Queue. 2. Write infix to postfix conversion algorithm using stack. 3- Write a short note on Circular Queue.	02 03 05	CO1	2
Q2 a	Write a function to do the following task. Given two singly linked lists(which are already created with **data** and **link** as members of the structure node), merge their nodes to make one list, taking nodes alternately between the two lists. ShuffleMerge() function with {1, 2, 3} and {7, 13, 1} as input, should yield {1, 7, 2, 13, 3, 1}. Write the function with a supportive diagram **OR** Write a function reverse(), which will take a pointer to the beginning of a singly linked list and reverse it. for example, if the list is {1,2,3} after reversal it should be { 3,2,1}. Illustrate your answer with a supporting diagram with an example. Note: Functional Implementation should not use additional Space	08	CO1	3
Q2b	What is a Generalized linked list? What are its applications? Give sample declaration in C language for Generalized linked list representation of multivariable polynomial expression. Represent the following polynomial expression with the help of GLL. Draw a supportive diagram $9x^5 z^3 + 7xy^4 z^2 + 10yz + 4$	10	CO1	3
Q.3. a	What is an AVL tree and why is it used? Construct an AVL tree for the given data where nodes are inserted in the following order. Explain all the applicable rotations during insertion. 27, 25, 23, 29, 35, 33, 34.	01 07	CO2	3

[PTO]

	After the construction of an AVL tree, perform the following delete operations in the given sequence: i. Delete node 25 ii. Delete node 33	02		
Q.3 b -i	Given an Arithmetic Expression : **3 * ((7+1) / 4) + (17 - 5)** 1- Convert the above expression into a Postfix expression. 2- Consider the result of (1) and Construct an arithmetic expression tree using the given Postfix expression as an input. Show stepwise construction of a tree using stack.	01 05	CO2	3
Q3 b-ii	Professor Banyan thinks he has discovered a remarkable property of binary search trees. Suppose that the search for key k in a BST ends up in a leaf. Consider three sets (1) set A, the keys to the left of the search path, (2) set B the keys on the search path and (3) set C, the keys on the right of the search path. Professor Banyan claims that any three keys $a \in A$, $b \in B$, and $c \in C$ must satisfy $a \leq b \leq c$. Is his claim true? Justify. Otherwise, give a counter-example to invalidate the professor's claim.	06		
Q3c	1-State the Properties of B tree 2- Show the B-tree of order- 6 that results when inserting the following 14 keys: **R, Y, F, X, A, M, C, D, E, T, H, V, L, W, G** (in that order). You need to only draw the trees just before and after each split. **OR** Consider the given initial B Tree of order 6 and Delete the given 5 keys: ***F, M*, G, *T*, and S** in the given order. Show the Updated B tree after every deletion and explain the applicable deletion case in detail for every key. (a) initial tree  	10 10	CO2	3
Q.4 a	Write a recursive program to Check if a given integer array represents a min heap or not. For example, if the array is 2,3,4,5,10,15 then it is min-heap. Support your answer with an example.	10	CO3	3

Q.4 b	Consider the following Fibonacci heap and perform the delete minimum operation and show the resulting Fibonacci heap. Also, explain the various steps performed. Note: that 26, 18, and 39 are marked nodes.  	10	CO3	3
Q5 a-i	1- Write an adjacency list for the graph in Fig.2. 2-Draw the breadth-first search tree traversal of the graph in Fig.2. with a neat diagram. Assume the starting vertex is 17. 3- Show the distance, and parent matrix of BFS traversal. Assume the BFS procedure considers the vertices in alphabetical order.  **Fig.2.**	06	CO2	3
Q.5. a-ii	Consider the depth-first-search of an undirected graph with 3 vertices P, Q, and R. Let discovery time d(u) represent the time instant when the vertex u is first visited and finish time f(u) represent the time instant when the vertex u is last visited. Given that $d(P) = 5$ units, $f(P) = 12$ units $d(Q) = 6$ units, $f(Q) = 10$ units $d(R) = 14$ unit, $f(R) = 18$ units Which one of the following statements is TRUE about the graph? and Justify A. There is only one connected component B. There are two connected components, and P and R are connected C. There are two connected components, and Q and R are connected D. There are two connected components, and P and Q are connected.	04		

Q.5. b	What is Hashing? Perform the operations given below, in the given order, on an initially empty hash table of size 13 using linear probing assuming modulo division. Show the calculations of every key operation. insert 5, insert 0, insert 32, insert 9, find 28, find 48, delete 32, delete 14, find 9, insert 25, insert 21, find 32. Show the updated hash table.	10	CO4	4