End Semester Examination

December 2022

Maxi Marks : 100

Class : S.E.

Course code: CS202

Name of the course : Data Structures

Duration : 3 hours

Semester : III

ranch :COMP/DS/AIML

Q No		Max Marks	CO	BL
Q1 a	Evaluate the following postfix expression using Stack diagrammatically. $4\ 3 - 3\ 8\ 2\ /\ +\ *\ 2\ \$\ 3\ +$	05	CO1	3
Q1b	Compare Priority Queue and Circular Queue. Explain Josephus' Problem.	05		
Q1c	Write a function to remove duplicates from ascending order sorted linked list **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.	05	CO1	4
Q1 d	What is a Generalized linked list? Represent the following list using GLL with shared sublist. Draw a supportive diagram. Give sample declaration in C language of Generalized linked list given below. L=(((1, 2, 3), (1, 2, 3), (2, 3), 6), 4, 5, ((2, 3), 6).	10	CO1	4
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}	5	CO2	4

Q2 b	Given a Binary Search Tree(BST) and a positive number k, write a program to find the kth 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.** **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.**	10	CO2	3

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.
	
	i) ii) iii)
	
	    FV D CF
	BD KS WXY ABC FGH AB D GHIJ
	  GH LMO TU
	
	iv) v)
	    CFV DGLT
	AB DE GHJKL WXYZ AB EF MOP UVW
	
	 OR
	i- State the properties of B tree
	
	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.
		10	CO2	3

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 construction of an AVL tree, perform following delete operations in the given sequence: i. Delete node 7 ii. Delete node 4	10	CO2	3
Q4a	Write properties of Binary heap data structure ? Show with example how the Max-heap data structure can be used to find kth largest element ?	10	CO3	3
Q4b	What is Fibonacci heap data structure ? Explain Decrease key operation with example. Example should include all cases	10	CO3	3

			CO2	4

Q5 a

fig 1.

1. Represent the graph in Fig. 1. using an adjacency List. **02**
2. Draw the BFS and DFS traversal for the graph in fig. 1.Assume the **06**
starting node is 'A'. Nodes should be visited in ascending order only.
3. Show Connected components found in DFS traversal. **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 $h(k) = k \bmod 10$ and linear probing. Draw the resultant hash table after insertion	**05**	CO4	4
b-ii	What is a collision? State different collision resolution techniques. Explain the separate chaining.	**05**		

CO Number	CO statement	Marks allotted
CO1	Apply various operations of linear and non-linear data structures to given problems.	25
CO2	Apply the concepts of Trees and Graphs to a given problem.	45
CO3	Apply various operations of heap data structures.	20
CO4	Apply the concepts of hashing on a given problem	10

PI chart for percentage CO marks