GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2022

DATA STRUCTURE

CS302

TIME ALLOTTED: 3Hours **FULL MARKS:70**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable

GROUP – A

(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No
1.	(i)	Which of the following is/are linear data structures? a. Tree b. Graphs c. Queue d. Table	1	CO4

	ii)	What does the following function do for a given Linked List with first node as head?
		void fun1(struct node* head)
		{
		if(head == NULL)
		return;
		
		fun1(head->next);
		printf("%d ", head->data);
		}
		a. Prints all nodes of linked lists
		b. Prints all nodes of linked list in reverse order
		c. Prints alternate nodes of Linked List
		d. Prints alternate nodes in reverse order
			1	CO2

	iii)	Which of the following statement(s) about stack data structure is/are NOT correct? a. Linked List are used for implementing Stacks b. Top of the Stack always contain the new node c. Stack is the FIFO data structure d. Null link is present in the last node at the bottom of the stack	1	CO4
	iv)	In a complete k-ary tree, every internal node has exactly k children or no child. The number of leaves in such a tree with n internal nodes is: a. Nk b. (N-1)K+1 c. n(k – 1) + 1 d. n(k – 1)	1	CO4

v) Binary search tree has best case run-time complexity of O(log n). What could the worst case? 1 CO2
   a. O(n)
   b. $O(n^2)$
   c. $O(n^3)$
   d. None of these

vi) In order traversal of binary search tree will produce – 1 CO4
   a. unsorted list
   b. reverse of input
   c. sorted list
   d. none of the above

vii) Interpolation search is an improved variant of binary search. It is necessary for this search algorithm to work that – 1 CO4
   a. A Data collection should be in sorted form and equally distributed.
   b. Data collection should be in sorted form and but not equally distributed.
   c. Data collection should be equally distributed but not sorted.
   d. None of these

viii) The height of a binary tree is the maximum number of edges in any root to leaf path. The maximum number of nodes in a binary tree of height h is: 1 CO4
   a. 2^h -1
   b. 2^(h-1) –1
   c. 2^(h+1) -1
   d. 2*(h+1)

ix) What is the value of the postfix expression 6 3 2 4 + – *? 1 CO3
   a. 1
   b. 40
   c. 74
   d. -18

x) The concept of order (Big-Oh) is important because 1 CO1
   a. It can be used to decide the best algorithm that solves a given problem
   b. It determines the maximum size of a problem that can be solved in a given system, in a given amount of time
   c. It is the lower bound of the growth rate of the algorithm
   d. Both A and B

xi) The following sequence of operations are performed on a stack 1 CO3
PUSH(10), PUSH(20), POP, PUSH(10), PUSH(20), POP, POP, POP, PUSH(20), POP
   The sequence of values popped out is :
   a. 20, 10, 20, 10, 20
   b. 20, 20, 10, 10, 20
   c. 10, 20, 20, 10, 20
   d. 20, 20, 10, 20, 10

xii) N elements of a queue are to be reversed using another queue. The number of "ADD" and "REMOVE" operations required to do so is — 1 — CO3

a. 2*N
b. 4*N
c. N
d. the task can't be performed

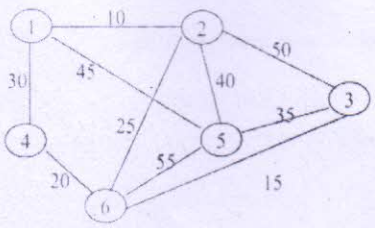
GROUP – B
(Short Answer Type Questions)
(Answer any *three* of the following) **3 x 5 = 15**

		Marks	CO No
2. a)	Differentiate linear data structures from nonlinear data structures with suitable examples.	3	CO1
b)	Justify that a queue can be considered as a priority queue.	2	CO1
3.	front=3, rear=5 Queue=_, _ ,2, 4 ,5, _, _, _ (_ states for empty cell) • 6 is added • Two elements are deleted • 10 and 12 added • Two elements are deleted • 2 and 3 are added. (i) What is the final value of front and rear for the following operation for straight queue? (ii) What is the final value of front and rear for the following operation for circular queue?	5	CO3
4.	Convert the following infix expression into equivalent postfix expression and evaluate the postfix expression with these following values: ((((a+b) / c) * d) / (e + f * g)) - (h / i - j) a=10, b=8, c=3, d=4, e=2, f=1, g=6, h=55, i=11, j=5.	5	CO3
5.	Create a B-tree of order 3 from the following lists of data items: 16, 20, 22, 42, 12, 30, 32, 18, 10, 34, 36, 38, 14, 24, 28, 40, 26. Clearly mention all the steps.	5	CO4
6.	Construct a binary tree from the following information: In-order: 50, 10, 30, 90, 60, 80, 40, 20, 70 Pre-order: 60, 10, 50, 90, 30, 40, 80, 70, 20 Mention each step clearly. What is the post order traversal of this tree?	5	CO4

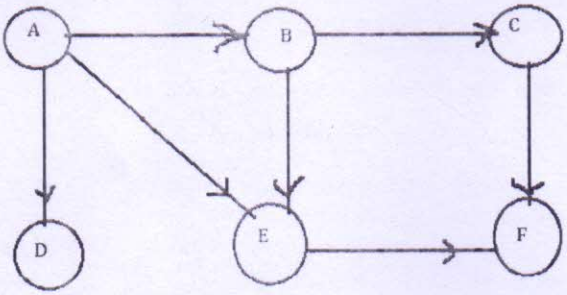
GROUP – C
(Long Answer Type Questions)
(Answer any *three* of the following) **3 x 15 = 45**

		Marks	CO No
7. a.	Construct an AVL tree mentioning each step clearly: 12, 11, 13, 10, 9, 15, 14, 18, 7, 6, 5, 22, 20, 9 and 4.	5	CO4

b.	Insert the following numbers in an empty BST: 40, 25, 70, 22, 35, 60, 80, 90, 10, 30. Draw the tree and perform the following operations (not successively) i) Delete 30 ii) Delete 80 iii) Delete 40	5	CO4
c.	Compare and contrast between. i) Singly and Doubly linked list. ii) B tree and B+ tree	5	CO3
8 a.	Show the working of Kruskal's Algorithm for finding MST on the following graph:	5	CO2



b.	Find the BFS and DFS traversal of this following tree:	10	CO5



9 a.	What do you mean by Max Heap? Explain with a suitable example.	5	CO3
b.	Create a Heap when the values 100, 200, 10, 30, 60, 80, 90 & 300 are entered.	5	CO2
c.	Write an algorithm for the Selection Sort algorithm.	5	CO4
10 a.	What is sparse matrix? Explain various types of sparse matrix.	5	CO5
b.	What is a Double Linked List? What are the advantages and disadvantages of Double Linked List?	5	CO2
c.	Write an algorithm to insert a data element after a particular data element in a singly linked list.	5	CO3
11.	Write Short note: (Any three)	3x5=15	
a.	Recursion Vs Iteration	5	CO3
b.	AVL tree	5	CO2
c.	Red/Black tree	5	CO3
d.	Asymptotic Analysis of Algorithms.	5	CO1
e.	Quick Sort	5	CO4