GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2022

DATA STRUCTURES

MCA20-201

TIME ALLOTTED: 3 Hrs **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 type of linked list contains a pointer to the next as well as previousnode in the sequence? a) Singly Linked List b) Circular Linked List c) Doubly Linked List d) All of these	1	CO1
	(ii)	"FRONT=REAR" refers that a queue is a) Full b) Circular c) Empty d) none of above	1	CO5
	(iii)	The postfix expression for the infix expression A + B * (C + D) / F + D * E is: a) AB + CD + * F / D + E * b) ABCD + *F / + DE* + c) A*B + CD / F*DE ++ d) A + *BCD / F*DE ++	1	CO2
	(iv)	In a complete k-ary tree, every internal node has exactly k children orno 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	CO2
	(v)	Row-major order in two-dimensional array refers to a) All elements of a row are stored in memory in sequence followed by next row in sequence and so on. b) All elements of a row are stored in memory in sequence followed by next column in sequence and so on. c) All elements of a column are stored in memory in sequence followedby next column in sequence and so on. d) None of these.	1	CO1
	(vi)	Which of the following data structures finds its use in recursion? a) Stack b) Array c) Link List d) Queue	1	CO4

(vii)	A binary search tree contains the values 1, 2, 3, 4, 5, 6, 7, 8. The tree is traversed in pre-order and the values are printed out. Which of the following sequences is a valid output? a) 53124786 b) 53126487 c) 53241678 d) 53124768	1	CO2
(vii)	A digraph in which, outdegree is same as indegree is called: a) balanced b) symmetric c) regular d) None of these	1	CO3
(ix)	Merge sort uses a) Divide and conquer strategy b) Backtracking approach c) Heuristic Search d) Greedy approach	1	CO4
(x)	A full binary tree with 2n+1 nodes contains a) n leaf nodes b) n non-leaf nodes c) n-1 leaf nodes d) n-1 non-leaf nodes	1	CO3
(xi)	Binary search tree has best case run-time complexity of O(log n). What could the worst case? a) O(n) b) $O(n^2)$ c) $O(n^3)$ d) None of the above	1	CO3
(xii)	Which of the following is/are linear data structures? a) Tree b) Graphs c) Queue d) Table	1	CO2

GROUP – B
(Short Answer Type Questions)

(Answer any *three* of the following) **3 x 5 = 15**

			Marks	CO No
2.	(a)	What is data structure?	2	CO1
	(b)	Draw the expression tree of the following expression. ((x + y) + z / (p - q)+ r)* (a + b)	3	
3.	(a)	What is the significance of abstract data type (ADT).	2	CO2
	(b)	Compare and contrast of STACK and QUEUE.	3	
4.		What is Threaded binary tree? Explain different types of Threaded binarytree.	5	CO3

5. front=3 rear=5 — 5 — CO2

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.

a) What is the final value of front and rear for the fallowing operation forstraight queue?

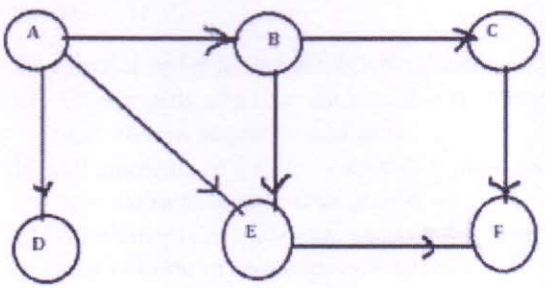
b) What is the final value of front and rear for the fallowing operation forcircular queue?

6. 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 — CO3

GROUP – C
(Long Answer Type Questions)

(Answer any *three* of the following) **3 x 15 = 45**

			Marks	CO No
7.	(a)	What is sparse matrix? Explain various types of sparse matrix.	5	CO5
	(b)	How polynomials can be represented using array?	5	
	(c)	Consider a 2D array arr[20][20] having base address 2000 and no. of bytes per element is 2. Compute the address of arr[9][15] in row major and column major order.	5	
8.	(a)	What is the application of stack data structure?	5	CO1
	(b)	Convert the following infix expression into equivalent postfix expression and evaluate the postfix expression with these followingvalues: ((((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.	10	
9.	(a)	What are the advantages of using linked lists over arrays? Explain with example.	5	CO3
	(b)	Explain double linked list. Explain with diagram	5	
	(c)	Given below are the preorder and in-order traversals of a binary tree. Draw the actual tree representation and write its post-order traversal. Preorder: A B D G H E I C F J K In-order: G D H B E I A C J F K	5	
10.	(a)	What do you mean by external sorting? How does it differ from internal sorting?	5	CO2
	(b)	Find the BFS and DFS traversal of this following tree:	10	



11.	(a)	Explain different collision resolution techniques of hashing.	5	CO4
	(b)	Write an algorithm for sorting a list of numbers in ascending order usingQuick Sort technique and find it's time complexity in average case.	10	