GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2021
DATA STRUCTURE AND ALGORITHM (Backlog)
CS(FT)615A

TIME ALLOTTED: 3 HOURS   **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: $10 \times 1 = 10$

			Marks	CO No
1.	i)	No of edges in a complete connected graph is	1	CO3

        a) $2n+2$
        b) $2^n - 2$
        c) $n^2 - 2$
        d) $n(n-1)/2$

ii) How many swaps are required to sort the given array using bubble sort - { 2, 5, 1, 3, 4}   1   CO2
        a) 4
        b) 5
        c) 6
        a) 7

iii) The result of evaluating the postfix expression 5, 4, 6, +, *, 4, 9, 3, /, +, * is?   1   CO2
        a) 600
        b) 350
        c) 650
        d) 588

iv) Time complexity of quick Sort in average case is   1   CO4
        a) $O(n2)$
        b) $O(n \log n)$
        c) $O(\log n)$
        d) None of these

v) Stack is also called as   1   CO5
        a) Last in first out
        b) First in last out
        c) Last in last out
        d) First in First Out

vi) Infix notation for the postfix expression AB+C*D/   1   CO2
        a. (A+B)/D*C
        b. (A+B)*C/D
        c. B-C*D+A
        d. None of these

vii)	Maximum no of nodes in a binary tree of depth 5 is a) 31 b) 16 c) 32 d) 15	1	CO2
viii)	The initial configuration of a queue is a, b, c, d, ('a' is in the front end). To get the configuration d, c, b, a, one needs a minimum of a) 2 deletions and 3 additions b) 3 deletions and 2 additions c) 3 deletions and 3 additions d) 3 deletions and 4 additions	1	CO2
ix)	A binary tree is balanced if the difference between left and right sub-tree of every node is not more than ____ a) 1 b) 3 c) 2 d) 0	1	CO2
x)	What is the postfix form of the following prefix *+ab–cd a) ab+cd–* b) abc+*– c) ab+*cd– a) none of these	1	CO1
xi)	Consider the following operation performed on a stack of size 5. Push(1); Pop(); Push(2); Push(3); Pop(); Push(4); Pop(); Pop(); Push(5); After the completion of all operation, the number of elements present in stack are a) 1 b) 2 c) 3 d) 4	1	CO 3
xii)	A normal queue, if implemented using an array of size MAX gets full when a) Rear = MAX – 1 b) Front = (rear + 1)mod MAX c) Front = rear + 1 d) Rear = front	1	CO3

GROUP – B
### (Short Answer Type Questions)
Answer any *three* from the following: 3×5=15

		Marks	CO No
2.	Convert the following infix expression into equivalent postfix expression using stack. (A + B) *C + (D / E) +F – G * H	5	CO3
3.	In a two dimensional array 15X12 with each element occupying 2 bytes of memory with the address of the first element [1, 1] is 2000. Find the address of [9, 8] for both Row-major and Column-major cases.	5	CO2
4.	Write down the algorithm to solve the game 'Tower of Hanoi'.	5	CO3

5.		Write an algorithm or function to insert one node at beginning of the linked list.	5	CO4
6.		Write an algorithm to print the elements in reverse order using linked list.	5	CO2

GROUP – C
(Long Answer Type Questions)
Answer any *three* from the following: **3×15=45**

			Marks	**CO No.**
7.	a)	Write down the algorithm of quick sort.	7	CO4
	b)	Write an algorithm or function to delete the element from simple queue.	5	CO1
	c)	Discuss about Linear Probing.	3	CO2
8.	a)	The in-order and post-order traversal sequence of nodes in a binary tree are given below In-order: - B E D F A G C I H Post-order:- E F D B G I H C A Construct the tree	6	CO3
	b)	What is the difference between tree and graph? What is spanning tree?	3	CO5
	c)	Construct a AVL tree from the given data: 12, 13, 10, 9, 8, 5, 1, 16, 18, 20, 17	6	CO3
9.	a)	Evaluate the expression-using prefix. (10*5+6) / 8+ (5+7*3) /6+2 / 4	7	CO1
	b)	Write an algorithm to insert a node at the beginning of a circular linked list.	5	CO2
	c)	If N_0 be the total no of leaf nodes and N_2 be the no of nodes having two children in a binary tree, then prove that: $N_2 = N_0 -1$.	3	CO2
10.	a)	Show each step to construct a min heap from the following numbers in the order in which they are given: 20, 50, 12, 15, 61, 21, 18, 28, 25, 7, 19, 2.	5	CO1
	b)	a) Show the stages in growth of 5 order B-tree when the following keys are inserted in the given order: 16, 20, 22, 42, 12, 30, 32, 18, 10, 34, 36, 38, 14, 24, 28, 40, 26	8	CO1
	c)	What is Input Restricted De-queue?	2	CO2

11. a) Find out the minimum spanning tree in the given graph by Kruskal's Algorithm.   8   CO1
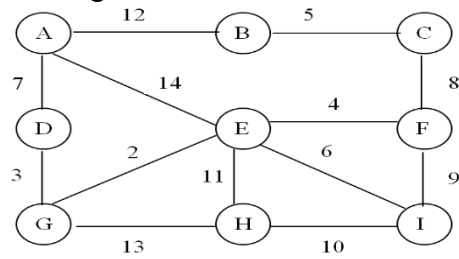
b) Built a weight balanced tree from the followings: 7   CO5

W1	W2	W3	W4	W5	W6	W7	W8	W9
7	10	11	4	5	8	9	11	16