GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2021
DATA STRUCTURE AND ALGORITHM
FT605A

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: $10\times1=10$

			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

			Marks	CO No
	ii)	A linear list in which element can be added or removed at either end but not in middle is known as	1	CO2

   a) Stack
   b) Heap
   c) De-Queue
   d) Linked list

			Marks	CO No
	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

			Marks	CO No
	iv)	Time complexity of quick Sort in average case is	1	CO4

   a) $O(n^2)$
   b) $O(n \log n)$
   c) $O(\log n)$
   d) None of these

			Marks	CO No
	v)	A vertex of degree zero is called	1	CO5

   a) Isolated vertex
   b) Pendant vertex
   c) Colored vertex
   d) Null vertex

			Marks	CO No
	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   1   CO2
    a) 31
    b) 16
    c) 32
    d) 15

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   1   CO2
    a) 2 deletions and 3 additions
    b) 3 deletions and 2 additions
    c) 3 deletions and 3 additions
    d) 3 deletions and 4 additions

ix) A binary tree is balanced if the difference between left and right sub-tree of every node is not more than ____   1   CO2
    a) 1
    b) 3
    c) 2
    d) 0

x) What is the postfix form of the following prefix *+ab–cd   1   CO1
    a) ab+cd–*
    b) abc+*–
    c) ab+*cd–
    a) none of these

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);   1   CO 3
After the completion of all operation, the number of elements present in stack are
    a) 1
    b) 2
    c) 3
    d) 4

xii) A normal queue, if implemented using an array of size MAX gets full when   1   CO3
    a) Rear = MAX – 1
    b) Front = (rear + 1)mod MAX
    c) Front = rear + 1
    d) Rear = front

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 a C program to implement binary search	5	CO4
	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
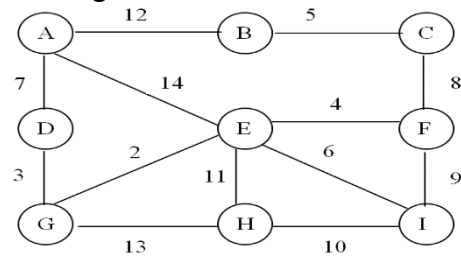
b) Built a weight balanced tree from the followings: 7   CO5

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