GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2022

DATA STRUCTURES AND ALGORITHMS

EI605A

TIME ALLOTTED: 3HR **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 data structure is used for breadth First Traversal of a graph? a) Stack b) Queue c) Link list d) None of these	1	CO3
	(ii)	Merge sort uses a) Divide & Conquer Strategy b) Greedy Approach c) Backtracking approach d) Heuristic Search	1	CO4
	(iii)	In a binary search tree, if the number of nodes of a tree is 9, then the minimum height of the tree is a) 9 b) 5 c) 4 d) None of these	1	CO2
	(iv)	A linked list is a a) Random access structure b) Sequential access structure c) Both A and B d) None of these	1	CO5
	(v)	The best case time complexity of bubble sort technique is a) O(kn) b) O(n2) c) O(nlog2n) d) O(log2n)	1	CO4
	(vi)	The postfix equivalent of the prefix expression *+ab-cd is: a) ab+cd-* b) abcd+-* c) ab+cd*- d) ab+-cd*	1	CO2

(vii)	A complete directed graph of 5 nodes has _____ number of edges a) 5 b) 0 c) 20 d) 25	1	CO2
(viii)	Pushing an element into stack already having five elements and stack size of 5, then stack becomes a) Overflow b) Crash c) Underflow d) User flow	1	CO3
(ix)	If a node in a Binary Search Tree (BST) has two children , then its inorder predecessor has a) No left child b) No right child c) Two children d) No child	1	CO4
(x)	Which type of linked list contains a pointer to the next as well as previous node in the sequence? a) Singly Linked List b) Doubly Linked List c) Circular Linked List d) All of these	1	CO1
(xi)	Insertion of an element at the ends of a linked list requires the modification of ____ pointers. a) 2 b) 1 c) 3 d) 4	1	CO5
(xii)	State true or false • An empty tree is also a binary tree. • In extended/ strictly binary tree, the out-degree of every node is either o or 2. a) True, False b) False, True c) True, True d) False, False	1	CO3

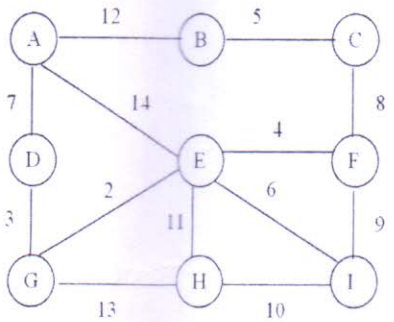
GROUP – B
(Short Answer Type Questions)
Answer any ***three*** from the following: **3×5=15**

		Marks	CO No
2.	Consider a 20X5 two-dimensional array "marks", which has its base address 1000 and the size of an element is 2 bytes. Now compute the address of element marks[18][4], assuming that the elements are stored in row major and column major order.	5	CO1

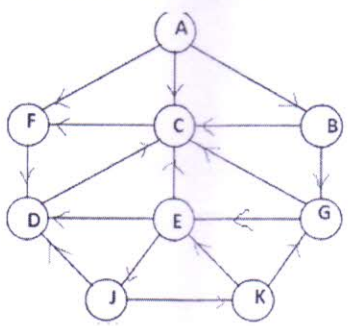
3.	(a)	What is binary tree?	1	CO2
	(b)	Given the preorder and inorder sequence, draw the resultant binary tree . Pre-order: A B D G H E I C F J K In-order: G D H B E I A C J F K	4	CO2
4.	(a)	Write down the algorithm of Bubble Sort.	3	CO4
	(b)	Find out the time complexity of Bubble sort.	2	CO4
5.		Write down the algorithms for PUSH and POP operation in a Stack.	5	CO2
6.		Create a B-Tree of order of 4 using the following nodes. 11,22,30,42,55,61,29,35,5,72,87,39	5	CO3

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

			Marks	CO No
7.	(a)	Write an algorithm to insert a new node at the end of a linked list.	6	CO1
	(b)	Represent the below polynomials using two way linked list. $p(x) = 8x^7 - 5x^6 - 3x^2 + 9x + 6$	4	CO3
	(c)	Write a recursive function to calculate factorial of a number.	5	CO2
8.	(a)	Convert the following infix expression into equivalent postfix expression using stack: A-(B/C+ (D%E*F)/G)*H	6	CO3
	(b)	What the differences are between array and link list data structure?	3	CO5
	(c)	Write an algorithm to insert a new data in a circular queue.	6	CO2
9.	(a)	Find out the minimum cost-spanning tree in the given graph by Prim's algorithm.	5	CO3



	(b)	Find out the Minimum Path from A to J using BFS	6	CO3



	(c)	Write the algorithm of Binary Search and explain with an example.	4	CO4

10.	(a)	Construct an AVL Tree by inserting 17, 89, 33, 15, 20, 25, 26, 6.	6	CO3
	(b)	Perform the deletion operation by deleting 15 and 89 from the same AVL Tree.	3	CO3
	(c)	Create a Binary Search Tree (BST) using the following data elements. 45, 39, 56, 12, 34, 78, 32, 10, 89, 54, 67, 81. Find out the post order traversal equation from the resultant tree.	6	CO3
11.		Write short notes on *any* ***three*** of the following:	3x5=15	
	(a)	Hash Function	5	CO4
	(b)	Max Heap and Min Heap	5	CO3
	(c)	ADT	5	CO2
	(d)	Threaded Binary tree	5	CO2
	(e)	Tower of Hanoi	5	CO3