QP Code: R252A003 | Reg. No | | | | | | | | | | | AR 23/24

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, ODISHA, GUNUPUR
(GIET UNIVERSITY)

B. Tech (Second Semester – Regular/Supplementary) Examinations, April – 2025

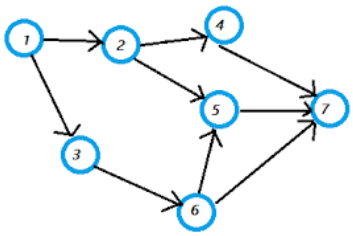
22BBSES12003/23BBSES12003 – Data Structures and Algorithms

(Common to All)

Time: 3 hrs | Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

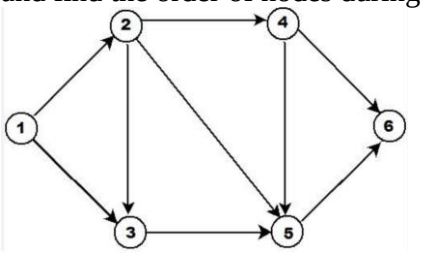
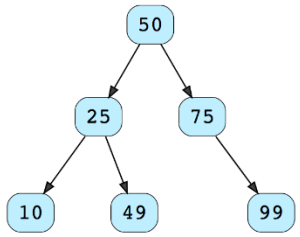
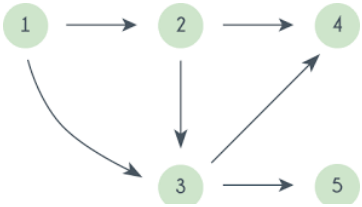
PART – A **(2 x 5 = 10 Marks)**

	Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a.	Given a matrix Q[8][8] having the base address of 9000 and each memory location size is of 5 bytes. Find the address of Q[4][3] using row-major order.	CO2	K1
b.	Given an array, that implements the stack concept. Explain the conditions that are used to identify the overflow and underflow situations.	CO1	K1
c.	Construct a binary tree when the sequence of nodes given below: Pre-order sequence : 51, 21, 11, 31, 25, 35, 71, 61, 91 In-order sequence : 11, 21, 25, 31, 35, 51, 61, 71, 91	CO2	K2
d.	Construct an Expression Tree for the given infix expression (B/C-D^E*F+G).	CO2	K3
e.	Find the in-degree and out-degree of each vertex of the graph given below: 	CO3	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions

		Marks	CO #	Blooms Level
2. a.	Given an array Q[10] having elements 10,20,30,40,50 from index 0 to index 4. Write down the two algorithms for implementing insertion operation and deletion operation on the array.	5	CO3	K1
b.	Given a list of elements as follows: 670, 903, 786, 451, 234, 432, 975, 444, 810, 339, 287. Explain the process of Radix sort neatly for the above list of elements to sort in ascending order.	5	CO3	K1
	(OR)			
c.	Given infix expression Q = A-S/D+(E*F^G)-H Elaborate and find the equivalent postfix notation of the above expression using a stack.	5	CO4	K2
d.	Explain the process of quick sort and write down algorithm for the given list of elements: 34, 56, 12, 23, 90, 78, 67, and 45 in ascending order.	5	CO3	K3
3.a.	A stack STACK[SIZE] where SIZE=4 is given. Initially, the TOP = -1. Apply the list of operations on the stack: PUSH(10), PUSH(20), POP(), PUSH(30), PUSH(40), PUSH(50), PUSH(60), POP(), POP(), POP(), PUSH(70). Elaborate suitably the push and pop operation of elements.	5	CO3	K3
b.	What is a Binary Search Tree? Write down the steps of the algorithm for inserting an element into a Binary Search Tree.	5	CO3	K4
	(OR)			
c.	A stack of books maintained in a rack that implements operations using LIFO concept. Design algorithms for the below operations: • Pushing of a New book in to Stack top. • Popping a Book from top of Stack.	5	CO4	K3

d.	What is a sparse matrix? Write down the algorithm to test a given matrix is sparse or not, if sparse then explain how to store the non-zero elements information into an alternate 3-columnar matrix?	5	CO2	K2
4.a.	Given a single linked list having 5 nodes and contains values 10, 20, 30, 40, 50 Design an algorithm to create a new node and insert it at the end of the linked list.	5	CO3	K2
b.	Write down the algorithm and also Evaluate the postfix expression given below: 50 , 60, * , 240 , 20 , 30, ^ , / , - using stack.	5	CO3	K2
	(OR)			
c.	Given a double linked list having 5 nodes and the START pointer holds the address of 1st node. Design an algorithm that creates a new node and then inserts the node at the beginning of linked list.	5	CO3	K3
d.	What is a Heap Tree, and what are its types? Explain the procedure for the construction of a Max heap Tree with a suitable example.	5	CO4	K2
5.a.	What is a balance factor? Construct a balanced binary search tree for the given list of elements: 70,20,10,30,40,50,60,25,35,75 by applying AVL rotations during insertion.	5	CO4	K2
b.	Briefly elaborate bubble-sorting method to sort a list of integers in ascending order.	5	CO2	K3
	(OR)			
c.	Write down the algorithm for implementing Depth First Search (DFS) traversal method on a graph. A graph is given below for which consider node 1 as 1st node and find the order of nodes during traversal using depth first search. 	5	CO3	K4
d.	Write down the recursive traversal algorithms for in-order and pre-order approaches to traverse the nodes of a binary tree. Also find the in-order and pre-order sequence of nodes for the below tree. 	5	CO3	K3
6.a.	What is hash function? Apply division method on the given key 10 values: 120, 195, 354, 430, 627, 595, 315, 409, 747, 303 and generate hash addresses.	5	CO4	K2
b.	Explain the terminologies: Complete Binary Tree, Skew Binary Tree, Strictly Binary Tree, Height of a node, Depth of a node.	5	CO1	K3
	(OR)			
c.	What is adjacency matrix? Find the adjacency matrix and incidence matrix for memory representation of the below graph. 	5	CO2	K3
d.	Given a QUEUE[SIZE] where SIZE=5. Initially Front=-1 AND Rear=-1 Execute the operations given below on the linear queue QUEUE[5]. The list of operations are: INSERT (Q), INSERT (W), INSERT (E), INSERT (R) , DELETE(),DELETE(), INSERT (T), DELETE(), DELETE(). Elaborate suitably the insertion and deletion operation of elements.	5	CO4	K2

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