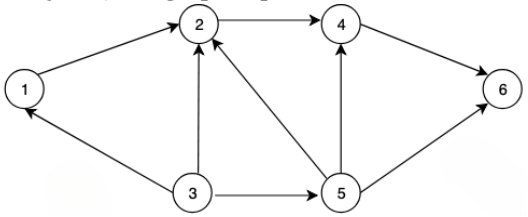
Name. _____ **Student Admn. No.: _____**	**Printed Pages:02**

School of Computing Science & Engineering
Backlog Examination, June 2023

[Programme: MCA] [Semester: II Sem] [Batch: Winter 20222-23]

Course Title: Data Structure Using C **Course Code:** MCAN1220	**Max Marks: 100** **Time: 3 Hrs.**

Instructions:
1. *All questions are compulsory.*
2. *Assume missing data suitably, if any.*

		K Level	COs	Marks
	SECTION-A (15 Marks) **5 Marks each**			
1.	Define data structure and provide three examples of commonly used data structures.	K1	CO1	5
2.	Explain the concept of abstract data types (ADTs) and how they differ from concrete data types. Provide an example of an ADT and describe its characteristics.	K2	CO1	5
3.	Describe the purpose of using asymptotic notations, in analyzing algorithm complexity. Explain how Big O notation helps in comparing the efficiency of algorithms.	K1	CO1	5
	SECTION-B (40 Marks) **10 Marks each**			
4.	Explain the concept of a two-dimensional array and its implementation in memory using row and column major ordering. Given A[4...7, -1...3], base address of the array (BA) = 100, size of an element = 2 bytes. Find the location of A[6][2].	K2	CO2	10
5.	Outline the drawbacks of the implementation of Queue data structure using Array. How Circular Queue overcome the limitations of basic operations involved in a queue.	K3	CO2	10
6.	Compare the advantages of linked lists over arrays in terms of memory allocation and flexibility. Explain the process of inserting a node at a beginning in a singly linked list, including the necessary steps.	K4	CO2	10
7.	You are given an arithmetic expression in infix notation. **A + (B ∗ C - (D / E ^ F) ∗ G) ∗ H** Apply the stack data structure to convert this expression into prefix notation. Show each step of the conversion process and provide the resulting prefix expression. **OR** You are given an arithmetic expression in infix notation. **A - B / C ^ D ∗ E + F / G** Apply the stack data structure to convert this expression into postfix notation. Show each step of the conversion process and provide the resulting postfix expression.	K3	CO3	10
	SECTION-C (45 Marks) **15 Marks each**			
8.	Compare and contrast the sequential representation (adjacency matrix) and linked representation (adjacency list) for graph representation.  Represent the following graph using both adjacency matrix and adjacency list.	K4	CO3	15

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9.	Evaluate the time complexity of selection sort, bubble sort, insertion sort, quick sort, merge sort, and heap sort for best, average, and worst-case scenarios. Analyze and determine which sorting algorithm is the most appropriate choice when sorting large data sets or dealing with scenarios that have limited memory resources. Demonstrate the step-by-step explanation of the sorting the given elements using the Merge Sort algorithm. **[12, 31, 25, 8, 32, 17, 40, 42]**	K5	CO4	15
10	Examine the given sequences of pre-order and in-order traversals for a binary tree: • **Pre-order: A B D H E C F I G J K** • **In-order: D H B E A I F C J G K** Construct the corresponding binary tree based on these sequences and determine its post-order traversal. OR Examine the given sequences of post-order and in-order traversals for a binary tree: **Post-order: H I D J E B K F G C A** **In-order: H D I B E J A K F C G** Construct the corresponding binary tree based on these sequences and determine its pre-order traversal.	K5	CO4	15