(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

SECOND SEMESTER [BCA] MAY-JUNE, 2025

Paper Code: BCA-106T **Subject: Data Structures & Algorithms**

Time: 3 Hours **Maximum Marks: 60**

Note: Attempt all questions as directed. Internal choice is indicated.

Q1 Attempt **any Four** of the following questions: **(4x5=20)**

(a) Write the algorithm for binary search and explain how it is more efficient than linear search in terms of time complexity.

(b) Define hashing. Explain any two collision resolution techniques used in hash tables.

(c) Differentiate between static memory allocation and dynamic memory allocation.

(d) Write a C program to traverse a Circular Linked List and display all the elements.

(e) Write the algorithm for a postfix expression evaluation using a stack. Also, evaluate the following postfix expression using a stack.
5 6 2 + * 12 4 / -

(f) Compare linear and circular queues. Why is a circular queue preferred over a linear queue in many applications?

(g) Differentiate between full, complete, and strict binary trees with diagrams.

(h) Construct the binary tree using the following traversals:
Inorder: G D B E H A F C I
Preorder: A B D G E H C F I

Q2 Describe data structure and its types with an example. Write a C program to implement Insertion Sort. Also, explain the best case, average case, and worst-case time complexity of Insertion Sort with an example. **(10)**

OR

Q3 Explain a sparse matrix with a suitable example. An array A[10][10] is stored in memory with base address 1000. Each element occupies 4 bytes. Calculate the address of the element A[6][8]in both row-major and column-major order. **(10)**

Q4 Write a C program to perform the following operation on a singly linked list: **(10)**

a) Insert a new node at the beginning
b) Delete the node at the end

OR

Q5 Explain the following types of linked lists using diagrams, with their advantages and disadvantages. **(10)**

a) Singly Linked List
b) Doubly Linked List
c) Circular Linked List
d) Header Linked List

P.T.O.

Q6 Explain a Doubly Ended Queue with an example. Write a C program to implement a queue using an array that includes basic operations: enqueue(), dequeue(), and display(). **(10)**

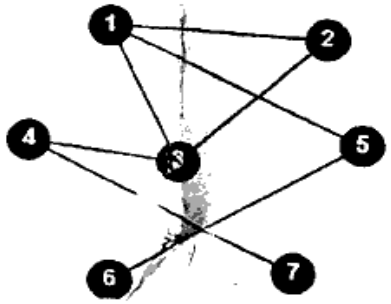
OR

Q7 Explain a stack with a suitable example. Describe the stack-based algorithm to convert infix to postfix notation. Convert A + B * (C ^ D - E) / (F + G - H) using the algorithm, showing stack content at each step. **(10)**

Q8 Explain the AVL tree and binary search tree using a suitable example. Design both the AVL tree and the binary search tree for the following sequence of nodes: **(10)**
37, 12, 45, 8, 29, 3, 22, 50, 16, 41

OR

Q9 Define a graph and explain the different graph types with proper diagrams and real-life applications. Differentiate the graph fromthe tree data structure. Also, design the adjacency list and adjacency matrix of the following graph. **(10)**



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