

**END TERM EXAMINATION****SECOND SEMESTER [BCA] MAY-JUNE, 2025****Paper Code: BCA-106****Subject: Data Structure & Algorithm Using C****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)**

- Write the algorithm for binary search and explain how it is more efficient than linear search in terms of time complexity.
- Define hashing. Explain any two collision resolution techniques used in hash tables.
- Differentiate between static memory allocation and dynamic memory allocation.
- Write a C program to traverse a Circular Linked List and display all the elements.
- 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 / -
- Compare linear and circular queues. Why is a circular queue preferred over a linear queue in many applications?
- Differentiate between full, complete, and strict binary trees with diagrams.
- 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)**

- Insert a new node at the beginning
- Delete the node at the end

**OR**

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

- Singly Linked List
- Doubly Linked List
- Circular Linked List
- Header Linked List

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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)**

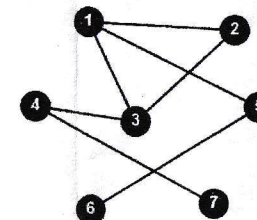
**OR**

Q7 Explain a stack with a suitable example. Describe the stack-based algorithm to convert infix to postfix notation. Convert  $A + B * (C \wedge D - E) / (F + G - H)$  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 from the tree data structure. Also, design the adjacency list and adjacency matrix of the following graph. **(10)**



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