

2025

COMPUTER SCIENCE — MDC

Paper : CC-3

(Data Structure)

Full Marks : 75

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

1. Answer *any five* questions : 2×5
- (a) Differentiate between linear and non-linear data structures with one example in each type.
  - (b) Convert the infix expression  $A * B + C$  into its equivalent Prefix form.
  - (c) How does a circular queue overcome the limitation of a linear queue?
  - (d) What is the key difference between singly linked lists and doubly linked lists in terms of memory and traversal?
  - (e) Differentiate between tail recursion and general recursion with one example.
  - (f) Name two open addressing techniques used in collision resolution during hashing.
  - (g) Write the differences between stack and queue.
  - (h) State the advantages of linked list over array.

**Group - A**

Answer *any three* questions.

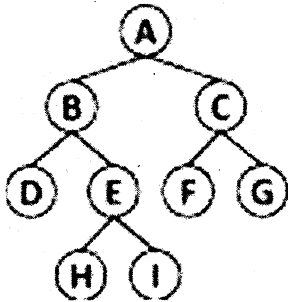
- 2. Sort the given numbers (21, 7, 8, 16, 4, 32, 9) in increasing order, using Selection sort. (Show all the steps) 5
- 3. Write the recursive definition to compute the factorial of a number. Discuss how internal stack helps in recursion. 5
- 4. Construct a binary search tree by inserting the following keys sequentially :  
55, 35, 75, 25, 44, 60, 80. 5
- 5. Write an algorithm that deletes the last node of the singly linked list. 5
- 6. Convert the following infix expression into postfix form  $(A+B)*(C+D)*E^F$  using an appropriate data structure. 5

**Please Turn Over**

**(5245)**

**Group - B**Answer *any five* questions.

7. (a) Sort the array [63, 33, 25, 12, 22, 11, 90] using bubble sort. Show each pass.  
 (b) Write an algorithm that insert a node at the beginning of the singly linked list. 5+5
8. (a) Explain separate chaining as a method to resolve collisions in hash tables with a suitable diagram.  
 (b) Construct a hash table of size 10 for keys : 12, 22, 32, 42 using the hash function  $h(k) = k \bmod 10$  and resolve collisions using chaining. 5+5
9. (a) Find all the traversals for the given tree



- (b) Write an algorithm that insert a node at the beginning of the double linked list. 6+4
10. (a) The following sequence of operations is performed on stack : PUSH (11), PUSH (22), POP, PUSH (10), PUSH (20), POP, POP, POP, PUSH (20), POP. What is the sequence of the value popped out?  
 (b) Convert the infix expression  $A + B * (C + D) / F + D * E$  into its equivalent postfix form using stack. 4+6
11. (a) Write down the function to insert an element into a linear queue, in which the queue is implemented as an array.  
 (b) Explain why binary search cannot be performed on a linked list.  
 (c) What is the length of the path in a tree? Create an expression tree for the expression given as  $(a - b) / (c * d) + e$ . 4+4+2
12. (a) Construct a min-heap with the following element and then arrange it in ascending order :  
 (Show all the steps.) 30, 62, 74, 80, 20, 10, 23, 13, 19, 37  
 (b) Write down the steps to invert a singly linked list to circular linked list. 5+5
13. (a) Prove that the height of a complete binary tree with  $n$  number of nodes is  $\lceil \log_2(n+1) \rceil$ .  
 (b) What are the pre-conditions to perform Binary search?  
 (c) Compare linear and binary search techniques. 5+2+3