

2024

Time : 3 hours

Full Marks : 70

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

The figures in the margin indicate full marks.

Answer from all the Sections as directed.

(Data Structure)

Section – A

1. Choose the correct answer from given options :

$1 \times 5 = 5$

- (a) Which of the following data structure is needed to convert infix notation to postfix notation ?
- (i) Tree
 - (ii) Branch
 - (iii) Stack
 - (iv) Queue

- (b) Which of the following application makes use of a circular linked list ?
- Recursive function calls
 - Undo operation in a text editor
 - Implement Hash Tables
 - Allocating CPU to resources
- (c) Which of the following tree data structures is not a balanced binary tree ?
- Splay tree
 - B-tree
 - AVL tree
 - Red-black tree
- (d) What is the time complexity for searching a key or integer in Van Emde Boas dat ?
- () ($M!$)
 - () ($\log M$)
 - () ($\log(\log M)$)
 - () (M^2)
- (e) If binary trees are represented in arrays, what formula can be used to locate a left child, if the node has an index i ?
- $2i + 1$
 - $2i + 2$
 - $2i$
 - $4i$

2. State True or False : $1 \times 5 = 5$
- Access of elements in linked list takes more time than compared to arrays.
 - The associativity of an exponentiation operator $^$ is right to left.
 - If two operators have the same precedence, associativity comes into action.
 - Binary search cannot be implemented using linked lists.
 - Implementing a doubly linked list is more difficult than singly linked list.

Section - B

3. Answer any four questions of the following : $5 \times 4 = 20$
- Distinguish between linear search and binary search.
 - Write an algorithm to traverse a binary search tree in post order.
 - Compare quick sort and selection sort.
 - Write a function to insert a number at the specified position of an array ?
 - What is sparse matrix ? How do you represent it using an array ?

- (f) Write a function to insert a node as last node in circular linked list.

Section- C

4. Answer any four questions of the following :

$$10 \times 4 = 40$$

- (a) Write an algorithm to perform Bubble sort.
- (b) Write a C program to perform push, pop and traverse operations in stack.
- (c) What are the rules to convert postfix expression to prefix expression using stack data structure ? Explain it using following postfix expression :

a b + c - d e f ^ ^ * g / .

- (d) Create a B tree of order 4 using the following list : 5, 3, 21, 9, 13, 22, 7, 10, 11, 14, 8, 16.
- (e) What is heap ? Explain max heap and min heap using the following list : 8, 71, 41, 31, 10, 11, 16, 46, 51, 31, 21, 13.
- (f) Write functions to insert and delete node specified by node number in doubly linear linked list.

