

2018

COMPUTER SCIENCE

(Major)

Paper : 3.1

(Data Structure and Algorithm)

Full Marks : 60

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

1. Define the following with example : 1×7=7
 - (a) Abstract data type (ADT)
 - (b) Stack
 - (c) Internal sorting
 - (d) Binary search tree
 - (e) Linear data structure
 - (f) Algorithm and flowchart
 - (g) Height of a binary tree

2. Answer the following questions : 2×4=8
 - (a) What are the advantages of linked lists over arrays?
 - (b) What is queue? How do you check whether a queue is empty or full?

- (c) Evaluate the following postfix expression using stack :

$$6\ 4+3*5/2\ 7\wedge 8/+$$

- (d) Describe how the elements in a two-dimensional array are stored in memory.

3. Answer any *three* of the following questions :

$$5 \times 3 = 15$$

- (a) Write a function in C language for implementing binary search technique in an array. What is the main drawback of this searching technique?

- (b) What is queue? Write briefly on two applications of each stack and queue in computer.

- (c) What is sorting? What are its different types? Sort the following list using bubble sort :

$$-1\ 15\ 0\ 10\ 25\ 5$$

- (d) Write a function in C language for traversing a binary tree in Inorder. Use a suitable data structure.

- (e) Write the algorithm of linear search technique. What is its time complexity? How is it different from binary search technique?

4. Answer any *three* of the following questions :

$$10 \times 3 = 30$$

- (a) Write a C program to implement a stack using array. Write functions for push and pop operations on a stack. $6 + 4 = 10$
- (b) Write an algorithm or a computer program in C for implementing any *one* of the following sorting techniques : 10
- (i) Quicksort algorithm
 - (ii) Merge sort algorithm
- (c) Define linked list. What are its different categories? Write C functions or algorithms to implement the following :
- (i) Insertion of a node into a single-linked list at beginning
 - (ii) Insertion of a node into a single-linked list at the end $2 + 8 = 10$
- (d) Define time and space complexity of an algorithm. Write an algorithm or a computer program in C for applying DFS on a binary tree. $4 + 6 = 10$

- (e) Give algorithms for preorder and post-order traversal of a binary tree. A binary tree T has 9 nodes. The inorder and preorder traversals of T yield the following sequences of nodes :

Inorder : E A C K F H D B G

Preorder : F A E K C D H G B

Draw the tree. 4+6=10

- (f) Write short notes on any *two* of the following : 5×2=10

(i) BFS (Breadth First Search)

(ii) Postfix expression using stack

(iii) Time complexity of selection sort technique

(iv) Heap sort technique
