44 (SEM–3) BCA–HC–3026

2024

(Held in 2025)

DATA STRUCTURE AND ALGORITHM

Paper : BCA–HC–3026

Full Marks : 60

Time : Three hours

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

*Answer **any six** questions.*

1. *(a)* What do you mean by Address Translation Function (ATF) of arrays ? Give the ATF for row major and column major orders in 2D arrays. 2+2+2=6

   (b) Given an array arr [1.....10][1.....15] with a base value of 100 and the size of each element is 1 byte in memory. Find the address of arr [8] [6] with the help of column-major order. 4

2. *(a)* Write a function to insert a node at a given position in a single linked list. 5

Cont'd

(b) Explain the process of displaying a circular linked list. 5

3. (a) Convert the following infix expression to postfix expression :

(((A – (B + C)) * D) ^ (E + F))

where,

Operator	Precedence	Value
Exponentiation (^)	Highest	3
*, /		2
+,–		1

All other symbols have usual meanings. 6

(b) Write a program to implement stack data structure with all the necessary operations. 4

4. (a) Write an algorithm or function to perform BFS. 5

(b) Construct a binary search tree from a given post-order and in-order sequences : 5

Inorder : D G B A H E I C F

Postorder : G D B H I E F C A

OR

Give recursive algorithms/functions for pre-order, in-order and post-order traversals of Binary Search Tree.

5. *(a)* What is quick sort? What is the best case complexity of quick sort? Sort the following using quick sort algorithm : 1+1+5=7

35, 63, 31, 89, 70, 90, 92

OR

Give an algorithm for implementing binary search. How is it different from linear search? Which one is better? Why? Compare. Also mention the complexities or each. 3+1+1+1+1=7

(b) Write an algorithm/function to implement bubble sort. 3

6. *(a)* What is complexity of algorithm? What are the cases of complexity of algorithm? 5

(b) Explain different asymptotic notions briefly. 5

7. *(a)* Choose the correct answer : 1×5=5

(i) Which among the following is a linear data structure?

(a) Queue

(b) Linked list

(c) Stack

(d) All of the above

(ii) Memory is allocated (in C) dynamically to a data structure during execution using

(a) malloc()
(b) calloc()
(c) realloc()
(d) All of the above

(iii) In stack data structure all insertions and deletions are made at

(a) one end
(b) middle
(c) both the ends
(d) any position

(iv) _____ is a step-by-step recipe for solving an instance of problem.

(a) Algorithm
(b) Complexity
(c) Process
(d) Analysis

(v) Maximum number of nodes at any level in a binary tree is

(a) n
(b) $n+1$
(c) $2n$
(d) All of the above

(b) What is an Algorithm? Mention the characteristics of a good algorithm. 5