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**Question Paper Code : 30007**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Second Semester

Artificial Intelligence and Data Science

AD 3251 — DATA STRUCTURES DESIGN

(Common to : Computer Science and Business Systems)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is ADT, give examples?
2. What is an Algorithm? How to compute its time complexity?
3. How double ended queue is different from circular queue?
4. What is Stack ADT? List its operations.
5. What is Hashing? What is its importance in data structures?
6. What is sorting in data structure and explain why in-place sorting is better?
7. Define tree traversal and what is the time complexity of level order traversal?
8. Define Heap in Data Structures.
9. What is a complete graph and represent  $K_4$  graph?
10. How many edges at most can a Directed Acyclic Graph possess, with number of vertices greater than 1?

## PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the concepts of Shallow and Deep copying with an example. (8)
- (ii) Write a short note on the ADT and Objects. (5)

Or

- (b) (i) Discuss the Analysis of recursive algorithm with factorial example. (7)
- (ii) Explain the concepts of Python Inheritance with an example. (6)
12. (a) (i) Write a program to derive an ADT to perform insertion and deletion in a singly linked list. (8)
- (ii) Discuss and write a python program to merge two sorted arrays. (5)

Or

- (b) (i) What is Priority Queue and analyse its implementation? (8)
- (ii) Write a program to implement the stack ADT using linked list (5)
13. (a) (i) Compare the quick sort with merge sort and write an algorithm to implement merge sort. (8)
- (ii) Derive the time complexity of the bubble sort algorithm. (5)

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- (b) (i) Write an algorithm for binary search with an example and explain any one method. (8)
- (ii) Discuss any two techniques to overcome hash collision. (5)
14. (a) (i) Illustrate the insertion and deletion operation performed in the binary heap. (8)
- (ii) Explain any one tree traversal technique with a suitable example and time complexity. (5)

Or

- (b) (i) Discuss the algorithm used to perform single and double rotation on AVL trees. (8)
- (ii) Explain with an example of multi-way search tree procedure. (5)
15. (a) (i) Differentiate depth-first and breadth-first search in detail. (8)
- (ii) Illustrate the depth-first search technique. (5)

Or

- (b) Examine the topological sorting of a graph G with an example and time complexity. (13)

## PART C — (1 × 15 = 15 marks)

16. (a) Convert the given infix expression  $AB * C + D / E - F$  into a postfix and postfix output into prefix expressions and explain the procedure in detail. Illustrate the steps. (15)

Or

- (b) Consider the given undirected graph and apply Prim's Algorithm to find the minimum spanning tree? Illustrate the steps. (15)

