



BCA/DAA-604

2024

(6th Semester)

BACHELOR OF COMPUTER APPLICATIONS

Paper : DAA-604

(Design and Analysis of Algorithms)

Full Marks : 70

Pass Marks : 45%

Time : 3 hours

(PART : B—DESCRIPTIVE)

(Marks : 45)

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

1. (a) Discuss the importance of problem solving techniques in algorithmic design with examples.

9

Or

- (b) Discuss the concept of algorithmic efficiency and its importance in algorithmic design.

5

(2)

- (c) Describe the various factors that contribute to the efficiency of an algorithm and techniques to improve it. 4
2. (a) Differentiate depth-first search and breadth-first search in graph traversal. 9

Or

- (b) Explain the working principle of Brute-Force string matching and also discuss the advantages and limitations. 9
3. (a) Enumerate the objective of constructing an optimal binary search tree and discuss its significance in searching. 9

Or

- (b) Explain the concept of knapsack problem with the two variants problem. 9
4. (a) Compare and contrast the correctness and optimality of minimum spanning trees produced by Prim's and Kruskal's algorithms. 9

Or

- (b) Discuss the role of data structures implementing in Prim's and Kruskal's algorithms efficiently. 9

5. (a) Explain the concept of NP-complete problem and their significance in computational complexity theory. 9

Or

- (b) Discuss the working environment of branch-and-bound algorithm. In what types of problem it is commonly used? 9

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(6th Semester)

BACHELOR OF COMPUTER APPLICATIONS

Paper : DAA-604

(Design and Analysis of Algorithms)

(PART : A—OBJECTIVE)

(Marks : 25)

The figures in the margin indicate full marks for the questions

A. Put a Tick (✓) mark against the correct answer in the brackets provided : 1×10=10

1. Algorithmic problem solving refers to

- (a) solving mathematical equations ()
- (b) finding solutions to real world problems ()
- (c) writing code for software application ()
- (d) debugging computer programs ()

2. Which efficiency class indicates the best time complexity?

(a) $O(1)$ ()

(b) $O(n)$ ()

(c) $O(\log n)$ ()

(d) $O(n^2)$ ()

3. In bubble sort, what is the time complexity in the worst-case scenario?

(a) $O(n)$ ()

(b) $O(n \log n)$ ()

(c) $O(n^2)$ ()

(d) $O(\log n)$ ()

4. The data structure commonly used to implement a priority queue efficiently is ____.

(a) linked list ()

(b) array ()

(c) stack ()

(d) binary heap ()

5. In the context to knapsack problem, 'knapsack' refers to
- (a) a type of bag ()
 - (b) a data structure ()
 - (c) the optimal solution ()
 - (d) a subset of items to be chosen ()
6. The primary objective of an optimal binary search tree is
- (a) to minimize the number of nodes ()
 - (b) to maximize the tree's height ()
 - (c) to minimize the average search time ()
 - (d) to maximize the average search time ()
7. Prim's and Kruskal's algorithm are used for
- (a) shortest path problem ()
 - (b) minimum spanning tree problem ()
 - (c) maximum flow problem ()
 - (d) All of the above ()

8. _____ data structure is typically used in Kruskal's algorithm to efficiently find the minimum weight edge.
- (a) Priority queue ()
 - (b) Stack ()
 - (c) Linked list ()
 - (d) Binary search tree ()
9. _____ involves finding the most cost effective way to pack items into knapsack of limited capacity.
- (a) Travelling salesman problem ()
 - (b) Optimal binary search tree ()
 - (c) Knapsack problem ()
 - (d) Longest common subsequence ()
10. The primary objective of the travelling salesman problem is
- (a) maximizing the profit earned by visiting cities ()
 - (b) minimizing the number of cities visited ()
 - (c) minimizing the total distance travelled while visiting each city exactly once ()
 - (d) maximizing the number of cities visited ()

B. State whether the following statements are *True (T)* or *False (F)* by putting a Tick (✓) mark : 1×5=5

1. Binary search is the example of divide-and-conquer algorithm.

True () *False* ()

2. DFS is not suitable for finding the shortest path in a graph.

True () *False* ()

3. The goal of knapsack problem is to maximize the total value of items selected, given a constraint on the total weight that can be carried.

True () *False* ()

4. Kruskal's algorithm always selects the edge with the minimum weight in each iteration.

True () *False* ()

5. Decision trees are used to determine the upper bound of an algorithm's time complexity.

True () *False* ()

C. Answer the following questions in short : 2×5=10

1. Define Big O notation and write its role in asymptotic analysis.

2. Compare merge sort and quick sort in terms of their time complexity.

3. List out one real world application where the knapsack problem is commonly encountered.

4. What is the time complexity for finding the minimum spanning tree in a graph with v vertices and e edges?

5. Define backtracking.

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