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BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – Dip.CSE-2022/Dip.CSE-2023

Course Name – Design and Analysis of Algorithm

Course Code - DCSE-PC402

(Semester IV)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Identify the option that is not relevant for Algorithm analysis.
 - a) Best Case Analysis
 - b) Alpha Case Analysis
 - c) Average Case Analysis
 - d) Worst Case Analysis
- (ii) Identify the option that is best suited data structures for implementing a recursive algorithm.
 - a) Array
 - b) Linked List
 - c) Stack
 - d) Queue
- (iii) Select the approach to solve travelling salesman problem.
 - a) a spanning tree
 - b) a minimum spanning tree
 - c) bellman – ford algorithm
 - d) dfs traversal
- (iv) Identify from the following is/are property/properties of a dynamic programming problem.
 - a) Optimal substructure
 - b) Overlapping subproblems
 - c) Greedy approach
 - d) Both 1 & 2
- (v) Select problems that can be solved using dynamic programming.
 - a) Mergesort
 - b) Binary search
 - c) Longest common subsequence
 - d) Quicksort
- (vi) Select the worst-case time complexity of Quicksort .
 - a) $O(n)$
 - b) $O(1)$
 - c) $O(\log 2n)$
 - d) $O(n^2)$
- (vii) Choose the correct one, Floyd Warshall's Algorithm can be applied on _____.
 - a) Undirected and unweighted graphs
 - b) Undirected graphs
 - c) Directed graphs
 - d) Acyclic graphs
- (viii) Choose from the following that is a valid method for finding the maximum flow in a network flow graph.

- a) Kruskal's algorithm
c) KMP algorithm
- b) Ford-Fulkerson algorithm
d) none of these
- (ix) Choose the correct option that Ford-Fulkerson algorithm computes in a network flow graph.
- a) Maximum spanning tree
c) Maximum flow
- b) Maximum matching
d) Shortest path
- (x) Identify the importance of scalability, when designing algorithms for real-life problems.
- a) Scalability ensures that the algorithm is easy to understand
c) Scalability is irrelevant for real-life problems
- b) Scalability allows the algorithm to adapt to changing requirements and handle larger datasets
d) Scalability makes the algorithm less efficient
- (xi) Write the sufficient condition to detect cycle in a directed graph.
- a) Big-oh(V)
c) Big-Oh(VE)
- b) Theta(V2)
d) Theta(V3)
- (xii) Choose the correct option : Floyd Warshall Algorithm can be used for finding
- a) Single source shortest path
c) Minimum spanning tree
- b) Topological sort
d) Transitive closure
- (xiii) Choose the correct option: the value of k is 0 in the Floyd Warshall Algorithm means
- a) 1 intermediate vertex
c) N intermediate vertices
- b) 0 intermediate vertex
d) N-1 intermediate vertices
- (xiv) Select an example of linear time complexity.
- a) O(1)
c) O(n)
- b) O(log n)
d) O(n^2)
- (xv) Choose the correct option: Rabin Karp algorithm have worst case time complexity
- a) same as naive pattern searching algorithm
c) more than naive pattern searching algorithm
- b) less than naive pattern searching algorithm
d) none of these

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Write down the significance of the P vs NP problem in computer science. (3)
3. Explain some common applications of pattern matching in software development. (3)
4. Define the longest common subsequence (LCS) problem. (3)
5. Explain the 0/1 Knapsack Problem. (3)
6. Express the key steps involved in designing algorithms for real-life problems. (3)

OR

- Express the importance of considering constraints when designing algorithms for real-life problems. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Illustrate the Strassen's matrix multiplication algorithm, compare the time complexity of it with naive matrix multiplications. (5)
8. Compare and contrast Greedy and Dynamic Programming Approaches for problem solving. (5)
9. State master theorem with example. (5)
10. Write down the Floyd-Warshall algorithm and investigate its time complexity. (5)
11. Explain the Divide and Conquer technique using Merge Sort Algorithm. (5)
12. Differentiate P, NP and NP-Hard class. (5)

OR

Explain the NP-hard problem with the example of the Traveling Salesman Problem.

(5)

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