MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

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Paper Code : CS-501

DESIGN AND ANALYSIS OF ALGORITHM

Time Allotted: 3 Hours *Full Marks*: 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group – A

(Multiple Choice Type Questions)

1. Chose the correct alternative for each of the followings: 1×10=10

(i) Best case time complexity for Binary search in unsuccessful case is
(a) O(n) (b) O(log n)
(c) O(1) (d) O(n log n)

(ii) Time complexity of Quick sort in worst case is
(a) O(n) (b) O(log n)
(c) O(n^2) (d) O(n log n)

(iii) The Big O Notation of the expression f(n)=$n \log_2 n + n^2 + e^{\log_2 n}$ is
(a) O(n^2) (b) O($\log_2 n$)
(c) O($\log_2 n$) (d) O($e^{\log_2 n}$)

(iv) A machine needs a minimum of 100 ms to sort 1000 names by quick sort. The minimum time needed to sort 100 names will be approximately
(a) 50·2 ms (b) 6·7 ms
(c) 72·7 ms (d) 11·2 ms

(v) Time complexity for recurrence relation T (n)=2T(n/2) + n is
(a) O(log n) (b) O(n log n)
(c) O(n) (d) O(n^2)

(vi) Which of the following approaches is Divide and Conquer Strategy?

(a) Top-down (b) Bottom-up

(c) Both (a) and (b) (d) None of these

(vii) What is the time complexity to insert an element into a heap?

(a) O (*n*log*n*) (b) O (log*n*)

(c) O (*n*) (d) None of these

(viii) Which of the following design techniques is used in the Quick Sort Algorithm?

(a) Dynamic programming (b) Back tracking

(c) Greedy method (d) Divide and Conquer

(ix) The average number of comparisons performed by merge sort algorithm in merging 2 sorted lists of length 2 is

(a) 8/5 (b) 11/7

(c) 11/6 (d) 8/3

(x) Which of the following standard algorithms is not based on Dynamic Programming?

(a) Bellman-Ford Algorithm for single source shortest path

(b) Floyd Warshall Algorithm for all pairs shortest paths

(c) 0-1 Knapsack problem

(d) Prim's Minimum Spanning Tree

Group – B

(Short Answer Type Questions)

Answer *any three* of the following: 5×3=15

2. Discuss Job Sequencing with deadlines providing an example. 5

3. Write an algorithm for Graph Coloring Problem. What is the time complexity of the algorithm? 4+1=5

4. Derive the worst case time complexity of quick sort. 5

5. Write an algorithm to insert an element into a heap. What is the complexity of the algorithm? Justify. 3+2=5

6. Write a recursive algorithm for finding maximum and minimum from a list of elements. Also find the complexity of your algorithm. 3+2=5

Group – C

(Long Answer Type Questions)

Answer *any three* questions: 15×3=45

7. (a) Write an algorithm for matrix chain multiplication.

(b) Explain it with a suitable example. 8+7=15

8. (a) Write an algorithm for all pair shortest path also compute its complexity.

(b) Solve 8 Queen problem using Backtracking approach. 9+6=15

9. (a) What do you mean by Divide and Conquer Strategy?

(b) Write an algorithm for Merge Sort.

(c) Analyze the time complexity of Merge Sort algorithm. 3+8+4=15

10. (a) What is Heap property?

(b) Create a Max-Heap containing the following elements:

10, 20, 30, 40, 50, 60, 70, 80, 90, 100

(c) Write an algorithm of Heap Sort.

(d) Find the running time of this algorithm. 1+4+7+3=15

11. Write short notes on *any three*: 5×3=15

(i) Union Find Algorithm

(ii) Dijkstra's Algorithm

(iii) Ford-Fulkerson Algorithm

(iv) Bellman-Ford Algorithm

(v) Heuristic Algorithm