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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90412

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Fourth Semester

Computer Science and Engineering

CS 8451 — DESIGN AND ANALYSIS OF ALGORITHMS

(Common to: Computer and Communication Engineering/Information Technology)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are asymptotic notations? List their properties.

2. Analyze the time complexity for the following algorithm and prove that it is Linear Time Complexity.

```
int sum(int A[ ], int n)
{
int sum = 0, i;
for(i=0; i<n; i++)
sum=sum + A[i];
return sum;
}
```

3. Write down the best, worst and average case Complexity for Quicksort.

4. How to apply brute force technique to compute a power n?

5. Define principles of optimality with a suitable example.

6. Distinguish between greedy technique and dynamic programming.

7. State stable marriage problem.

8. What is perfect matching in Bipartite Graph? Justify.

9. Differentiate between feasible and optimal solution.

10. State the reason for terminating search path at the current node in branch and bound algorithm.

PART B — (5 × 13 = 65 marks)

11. (a) List out the Steps in Mathematical Analysis of non-recursive Algorithms for finding the largest element in a given array.

Or

(b) With suitable example, explain how the efficiency of an algorithm is analysed.

12. (a) Propose a divide and conquer strategy-based procedure to search a key in a set of n elements. Demonstrate the process to search 18 in 6, 8, 15, 18, 22, 23.

Or

(b) Depict heapsort for the following elements 4, 1, 7, 5, 3, 9 and discuss about the stability of heapsort with the suitable example.

13. (a) With an example explain Prims algorithm to solve MST .

Or

(b) Explain and write Huffman code algorithm and derive its complexity.

14. (a) Justify the subset of bipartite graph is bipartite? Outline with an example.

Or

(b) Discuss in detail about maximum flow problem with a suitable example.

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15. (a) Give solution to Subset sum problem, if S={2, 3, 5, 8 } and t=10 using Backtracking technique.

Or

(b) Outline the steps to find approximate solution to NP-Hard optimization problems using approximation algorithms with an example.

PART C — (1 × 15 = 15 marks)

16. (a) Elaborate how backtracking technique can be used to solve the n-queens problem. Explain with an example.

Or

(b) Find an optimal solution to the 0/1 knapsack problem for an instance with number of items 7, Capacity of the sack m=15, profit associated with the items (p1, p2, ..., p7)=(10,5,15,7,6,18,3) and weight associated with each item (w1, w2,...w7)=(2,3,5,7,1,4,1).