SNS COLLEGE OF ENGINEERING

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AN AUTONOMOUS INSTITUTION

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Question Bank -5 Units

Fourth Semester

B.E.Computer Science and Technology

23TSB202- Analysis of Algorithm

Regulations 2023

2 Marks

Unit-1

1. Explain about Asymptotic Notation representation.

2. What are the methods to specify an algorithm.

3. What are the Fundamentals of Algorithmic Problem Solving.

4. Interpret any three Problem types.

5. List the Basic Asymptotic Efficiency Class and its Order.

6. Solve following recurrence relation $T(n) = 2T(n/2) + n$ with $T(1) = 1$.

7. Solve $T(n) = 2T(n/2) + n \log n$ using Master Theorem.

8. Show an algorithm to subtract the product and sum of an integer with input 'n'=541. **(Leet Code)**

9. Show an algorithm to add two integers in array nums= [3,1,5]; target=6**(Leet Code).**

10. Show an algorithm that performs G.C.D using Euclidean's Algorithm **(Leet Code).**

Unit -2

11. Define Assignment Problem.

12. Relate Sorting & Searching that follows Divide and Conquer Method

13. Relate Sorting & Searching with Brute Force Method.

14. What is the basic principle of Selection Sort?

15. How does Bubble Sort perform sorting?

16. What is Sequential Search and where is it applicable?

17. Define the Closest-Pair Problem in computational geometry.

18. What is the objective of the Convex Hull Problem?

19. State the goal of the Traveling Salesman Problem.

20. Relate 0/1 Knapsack problem with Brute Force Method.

Unit-3

21. Infer the Principle of Optimality of Dynamic Programming and Give its Memory functions.

22. What is Optimal Binary Search Tree?

23. How is the binomial coefficient computed using dynamic programming?

24. How does Warshall and Floyd's algorithm compute shortest paths?

25. How does dynamic programming solve the Knapsack Problem?

26. Compare Prim's and Kruskal algorithm to build a minimum spanning tree?

27. How does Dijkstra's algorithm find the shortest path? Justify if it includes negative edges or not.

28. Relate Huffman Tree with Greedy Technique.

29. What is the goal of Job Sequence Scheduling using a greedy approach?

30. When does the greedy method fail to give an optimal solution?

Unit-4

31. Explain maximum flow problem?

32. Compare KMP (Knuth Morris Pratt) and Rabin-Karp over the naive approach.

33. What is the Ford-Fulkerson method, and what is it used for in network analysis?

34. What is maximum matching in bipartite graphs used for?

35. What is a flow network?

36. What is the significance of residual graphs in the Ford-Fulkerson method?

37. How is the maximum bipartite matching problem related to flow networks?

38. What is the basic principle of the Naïve String-Matching algorithm?

39. What is the purpose of the prefix function and LPS Array in the KMP algorithm?

40. How does Rabin-Karp algorithm use hashing in string matching?

Unit-5

41. Compare P, NP, and NP-Complete classes with one example each.

42. Explain Lower bound arguments in analyzing algorithms.

43. Write the condition for a Hamiltonian Circuit to exist in a graph.

44. What are the Constraints followed in n-queens problem and Subset Sum Problem?

45. Why is it difficult to solve NP-complete problems optimally?

46. Describe the Branch and Bound strategy in solving optimization problems.

47. What is an Approximation Algorithm, and why is it important in solving NP-hard problems?

48. Explain the use of backtracking in solving the Subset Sum Problem.

49. What is meant by the limitation of an algorithm and coping with algorithmic limitations

50. What is a decision tree and where is it used in algorithm design?

Big Questions

Note: Study each Topic specified below with Example, Algorithm and Complexities.

Unit-1

1.Classify Asymptotic Notations & its Mathematical Representation.

2.Explain properties of Asymptotic Notations with Efficiency Classes.

3.Interpret Mathematical Analysis of Non-Recursive and Recursive Algorithm with an example.

Unit -2

1.Quick sort/ Merge Sort

2.Convex Hull

3.Closest Pair

4.Assignment

Unit -3

1.Warshall and Floyd Algorithm

2.Prims and Kruskal

3.Dijkstra

Unit-4

1.Ford Fulkerson

2.Naïve String

3.KMP (Knuth Morris Pratt) Algorithm

4.Rabin Karp Algorithm

Unit-5

1.Backtracking 4 queens

2. Subset sum

3.Traveling Salesman

4.Knapsack

Leet Code Questions:

1. Apply Greedy Technique for assigning cookies to the child with greedfactor=[3,2,1]; sizefactor= [2,1] with its algorithm;

2. Apply binary searching mechanism and provide its algorithm & complexities with inputs; nums[] = {-1, 0, 3, 5, 10, 12} & target = 5.

3. Solve the Coin Problem using recursive function with its analysis and algorithm provided inputs; coins [] = {1, 2, 5} & amount= 11;