PRACTICE SET

End Semester Examination, Fall -2025

Program: BCA

Semester: Fifth

Course: Design and Analysis of Algorithms

Course Code: 3CCC303

Course Outcomes	Description
CO1	Analyze and evaluate algorithm efficiency using asymptotic notations and recurrence relation techniques.
CO2	Apply algorithmic design strategies to solve real-world problems using brute-force, greedy, dynamic programming, and backtracking methods.
CO3	Implement graph and tree algorithms such as DFS, BFS, shortest paths, MST, and topological sorting.
CO4	Classify computational problems into P, NP, NP-complete, and NP-hard categories and apply reduction techniques.
CO5	Understand and apply advanced algorithmic techniques like approximation and randomized algorithms to solve complex problems.

UNIT - I

Section -A

1. Describe the characteristics of an algorithm. [CO1] [UNIT-I] [UNDERSTAND] [LOT]
2. Describe the concept of Asymptotic Notations and their types. [CO1] [UNIT-I] [UNDERSTAND] [LOT]

3. Define an Algorithm. Explain the characteristics of an algorithm. [CO1] [UNIT-I] [UNDERSTAND] [LOT]
4. Illuminate Master theorem along with an example. [CO1] [UNIT-I] [UNDERSTAND] [LOT]
5. Describe Recurrence relation and its types along with an example. [CO1] [UNIT-I] [UNDERSTAND] [LOT]

Section -B

6. Find the Time complexity(T.C) of the following recurrence relations using the substitution method: $T(n)=8T(n/2) + n^2$ [CO1] [UNIT-I] [APPLY] [LOT]
7. What is an asymptotic notation? Explain all notations with suitable examples and also compare them. [CO1] [UNIT-I] [UNDERSTAND] [LOT]
8. What is the Recurrence equation? Which methods are used to solve the recurrence relation? [CO1] [UNIT-I] [UNDERSTAND] [LOT]

Section - C

9. Explain Substitution, Master and Recursive Tree method along with an example. [CO1] [UNIT-I] [ANALYSE] [HOT]
10. Solve the following recurrence relation using substitution and master methods:[CO1] [UNIT-I] [EVALUATE] [HOT]
    i. $T(n)=2T(n/2) + n$
    ii. $T(n)=2T(n/2) + \log n$

UNIT - II

Section – A

11. Differentiate between Linear Search and Binary Search algorithm. [CO2] [UNIT-II] [UNDERSTAND] [LOT]
12. Discuss the concept of Brute Force Approach. [CO2] [UNIT-II] [UNDERSTAND] [LOT]

13. What is the divide and conquer algorithm? Discuss Strassen's Matrix Multiplication. [CO2] [UNIT-II] [REMEMBER] [LOT]
14. Explain in detail about the Knapsack Problem. [CO2] [UNIT-II] [UNDERSTAND] [LOT]
15. Describe the Merge sort technique along with an example. [CO2] [UNIT-II] [UNDERSTAND] [LOT]
16. Summarize backtracking and branch and bound algorithms. [CO2] [UNIT-II] [UNDERSTAND] [LOT]
17. What do you understand by Substring and Subsequence? [CO2] [UNIT-II] [REMEMBER] [LOT]

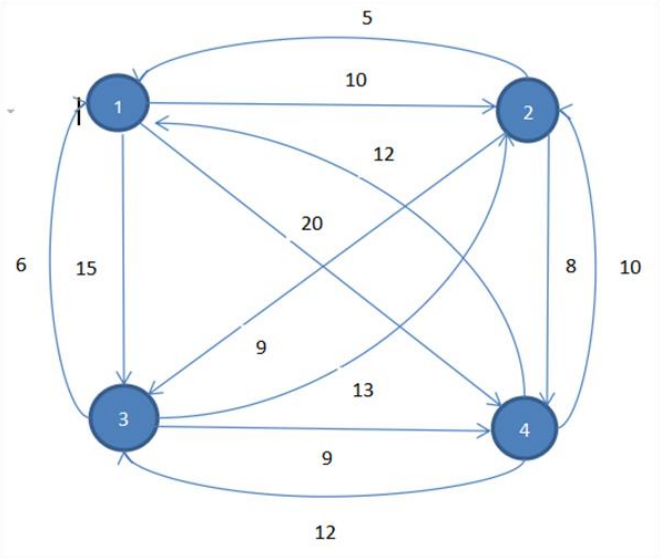
Section – B

18. Describe the concept of Job Sequence with deadline and Huffman Coding. [CO2] [UNIT-II] [UNDERSTAND] [LOT]
19. Explain the working rule of Binary search Algorithm and find the time complexity using recursion tree method. [CO2] [UNIT-II] [UNDERSTAND] [LOT]
20. What are heuristic search techniques? Discuss A* and Best First Search algorithm along with an example. [CO2] [UNIT-II] [UNDERSTAND] [LOT]

Section - C

21. Evaluate the following: **[**CO2**]** [UNIT-II] [EVALUATE] [HOT]
    i. Suppose A & B are two strings where A=ANJSANJ, B=SANJANJ. Find LCS & its length?
    ii. Let A1, A2, A3, and A4 be four matrices of dimensions 10 × 5, 5 × 20, 20 × 10, and 10 × 5, respectively. Find the Minimum no. of scalar multiplications to multiply the given matrix chain?

22. Evaluate the following: **[**CO2**]** [UNIT-II] [EVALUATE] [HOT]
    i. Describe the Travelling Salesman Problem briefly.
    ii. Given a directed weighted graph



Q. Find Minimum cost of tour from city 2 to remaining all cities using TSP Algorithm.

23. Compare and contrast between 1/0 Knapsack and fractional Knapsack. Find Maximum profit for the following using Fractional Knapsack Algorithm :- [CO2] [UNIT-II] [ANALYSE] [HOT]

Objects	**O1**	**O2**	**O3**
Profit	25	23	14
Weight	19	16	10

Where Knapsack size (M) (in gm) = 25

UNIT - III

Section – A

24. Differentiate between BFS and DFS algorithms. [CO3] [UNIT-III] [ANALYSE] [HOT]
25. What is a network flow algorithm? [CO3] [UNIT-III] [REMEMBER] [LOT]

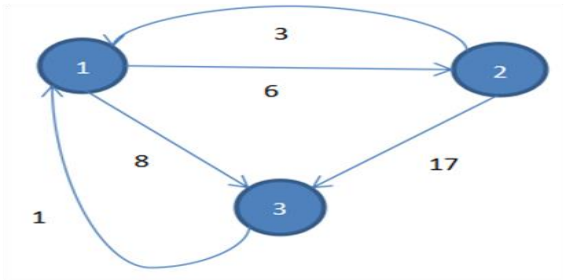
26. Explain topological sorting algorithm along with time complexity. [CO3] [UNIT-III] [UNDERSTAND] [LOT]
27. What is spanning tree and minimum spanning tree? [CO3] [UNIT-III] [REMEMBER] [LOT]
28. What do you mean by the single source shortest path (SSSP) algorithm? [CO3] [UNIT-III] [REMEMBER] [LOT]

Section – B

29. Explain the concept of graph traversal BFS and DFS with examples. [CO3] [UNIT-III] [UNDERSTAND] [LOT]
30. Difference between Tree, Spanning tree & Minimum spanning tree. [CO3] [UNIT-III] [UNDERSTAND] [LOT]
31. Explain in detail about the Maximum flow problem using the Ford Fulkerson algorithm. [CO3] [UNIT-III] [UNDERSTAND] [LOT]
32. Evaluate the concept of prim's and kruskal algorithm with an example. [CO3] [UNIT-III] [EVALUATE] [HOT]
33. Explain the Topological sorting with suitable example. CO3] [UNIT-III] [UNDERSTAND] [LOT]

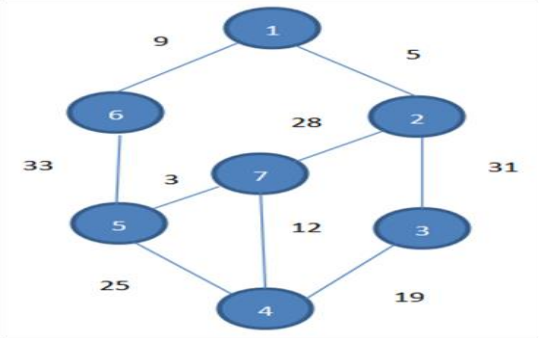
Section – C

34. Evaluate the following **: [**CO3**]** [UNIT-III] [EVALUATE] [HOT]
    i. Write Dijkstra algorithm along with an example
    ii. Given a directed weighted graph



Q. Find shortest path distance between every pair of vertices using Floyd-Warshall Algorithm.

35. Given a undirected weighted graph



Q. Find MST for the following graph by applying the following: - [CO3] [UNIT-III] [EVALUATE] [HOT]

i. kruskal's Algorithm where starting vertex =1
ii. Prim's Algorithm where starting vertex =1

Also, find the weight of MST.

UNIT - IV

Section – A

36. Explain Cook's theorem. [CO4] [UNIT-IV] [UNDERSTAND] [LOT]
37. Difference between P Class, NP-hard and class NP-complete class. [CO4] [UNIT-IV] [ANALYSE] [HOT]

Section – B

38. Difference between Tractable Problem and Intractable Problem along with an example of each. [CO4] [UNIT-IV] [ANALYSE] [HOT]
39. Write a short note on the types of Complexity classes along with an example of each. [CO4] [UNIT-IV] [UNDERSTAND] [LOT]

UNIT - V

Section – A

40. What is a Randomized Algorithm? **[**CO5**]** [UNIT-V] [REMEMBER] [LOT]
41. Explain the Approximation Algorithm. **[**CO5**]** [UNIT-V] [UNDERSTAND] [LOT]

Summary Sheet

Course Outcomes (CO) Wise

CO	Q. No	Marks
CO1	1.2.3.4.5.6.7.8.9.10	95
CO2	11.12,13,14,15,16,17,18,19,20,21,22, 23	125
CO3	24,25,26,27,28,29,30,31,32,33,34,35	105
CO4	36, 37,38,39	30
CO5	40, 41	10
Total		365

Unit Wise

Unit	Q. No	Marks
Unit 1	1.2.3.4.5.6.7.8.9.10	95
Unit 2	11.12,13,14,15,16,17,18,19,20,21,22,23	125
Unit 3	24,25,26,27,28,29,30,31,32,33,34,35	105
Unit 4	36, 37,38,39	30
Unit 5	40, 41	10
Total		365

Blooms Taxonomy Level (BTL) Wise

BTL	Q. No	Marks
LOT	1,2,3,4,5,6,7,8,11,12,13,14, 15,16,17,18,19,20,25,26,27, 28,29,30,31,33,36,39,40,41	205
HOT	9,10,21,22,23,24,32,34,35,3 7,38	160
Total		365

Prepared by: Binod Kumar

Disclaimer: - This is a Practice Set. The Question in End term examination will differ from the Practice set. This Practice set is meant for practice only.