

LABORATORY MANUAL

18CSL47 - Design and Analysis of Algorithm Laboratory

2019-20



DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING
ATRIA INSTITUTE OF TECHNOLOGY
Adjacent to Bangalore Baptist Hospital
Hebbal, Bengaluru-560024

SYLLABUS**SEMESTER – IV****Subject Code 18CSL47****Exam Marks 60****IA Marks 40****Exam Hours 03**

1. a) Create a Java class called Student with the following details as variables within it.
- (i) USN
 - (ii) Name
 - (iii) Branch
 - (iv) Phone

Write a Java program to create n Student objects and print the USN, Name, Branch, and Phone of these objects with suitable headings.

- b) Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.

2. a) Design a super class called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a Java program to read and display at least 3 staff objects of all three categories.

b) Write a Java class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as “/”.

3. a) Write a Java program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.

b) Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

4. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of $n > 5000$ and record the time taken to sort. Plot a graph of the time taken versus n on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

5. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of $n > 5000$, and record the time taken to sort. Plot a graph of the time taken versus n on graph sheet. The elements can be read from a file or can be generated using the random number generator.

Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

6. Implement in Java, the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
7. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program in Java.
8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm using union-find algorithm.
9. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's Algorithm.
10. Write Java programs to
 - (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.
 - (b) Implement Travelling Sales Person problem using Dynamic programming.
11. Design and implement in Java to find a subset of a given set $S = \{S_1, S_2, \dots, S_n\}$ of n positive integers whose SUM is equal to a given positive integer d . For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$, there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. Display a suitable message, if the given problem instance doesn't have a solution..
12. Design and implement to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using back tracking principle.

VIVA VOCE

1. What is algorithm?
2. what is O-notation?
3. what is theta-notation?
4. what is omega-notation?
5. what is order of growth?
6. what is time complexity?
7. what is space complexity?
8. what is input size?
9. what is best case?
10. what is worst case?
11. what is average case?
12. what is asymptotic notations?
13. what is recurrence relation?
14. what are the different methods used to solve recurrence method?
15. what is running time?
16. What are data structures?
17. what is linear data structures?
18. what is stack?
19. what is queues?
20. what is tree?
21. what is list?
22. what is doubly linked list?
23. what is singly linked list?
24. what is the general method of divide and conquer?
25. what is binary search?
26. what is the time complexity of binary search?
27. explain the logic of binary search?
28. what is the time complexity of finding maximum and minimum of numbers?
29. what is merge sort?
30. explain the logic of merge sort?
31. mention the time complexity of merge sort?
32. what is the worst case of merge sort?
33. what is quick sort?
34. trace out the quick sort concept for 5 numbers.
35. what is the time complexity of quick sort?
36. mention the worst case, best case, average case of quicksort.
37. what is greedy method?
38. what are the applications of greedy method?
39. what is knapsack problem?
40. what is minimum cost spanning tree?
41. what is the time complexity of prim's algorithm?
42. what is the time complexity of kruskal's algorithm?
43. what is the time complexity of dijkstra's algorithm?
44. what is the time complexity of knapsack problem?

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

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- Establishing learning ambience with best infrastructure facilities