DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

IV Semester: CSE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AITB07	Core	-	-	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

I. COURSE OVERVIEW:

Design and analysis of algorithm lab provides hands on experience in implementing different algorith- mic paradigms and develops competence in choosing appropriate data structure to improve efficiency of technique used. This laboratory implements sorting techniques using divide and conquer strategy, shortest distance algorithms based on Greedy, Dynamic programming techniques, Minimum spanning tree construction and applications of Back tracking , Branch and Bound. This is essential for devel- oping software in areas Information storage and retrieval, Transportation through networks, Graph theory and Optimization problems.

II. OBJECTIVES:

The course should enable the students to:

I	The selection of Algorithmic technique and Data structures required for efficient development of technical and engineering applications.
II	The algorithmic design paradigms and methods for identifying solutions ofoptimization problems..
III	Implementation of different algorithms for the similar problems to compare theirperformance.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Apply** Divide and conquer strategy to organize the data in ascending or descending order. .	Apply
CO 2	**Make use of** Algorithmic Design paradigms to determine shortest distance and transitive closure of Directed or UndirectedGraphs.	Apply
CO 3	**Utilize** Greedy Technique or principle of Optimality for finding solutions to optimization problems.	Analyze
CO 4	**Compare** the efficiencies of traversal problems using different Tree and Graph traversal algorithms.	Apply
CO 5	**Utilize** Backtracking method for solving Puzzles involving building solutions incrementally.	Analyze
CO 6	**Examine** Branch and Bound Approach for solvingCombinatorial optimization problems.	Apply

IV. SYLLABUS:

LIST OF EXPERIMENTS

Week-l	**QUICK SORT**

Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the 1st to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

Week-2	**MERGE SORT**

Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted

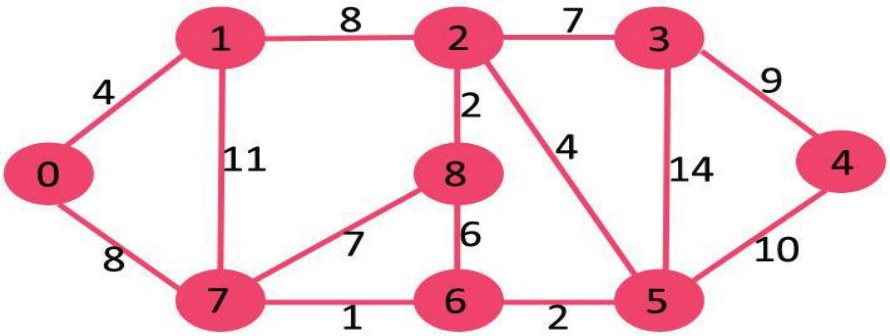
and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

Week-3	KNAPSACK PROBLEM

Implement 0/1 Knapsack problem using Dynamic Programming.

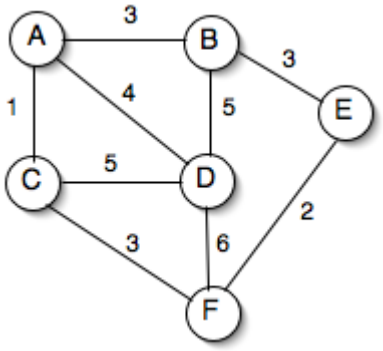
Week-4	SHORTEST PATHS ALGORITHM

From a given vertex in a weighted connected graph, find shortest paths from 0 to other vertices using Dijkstra‘s algorithm.



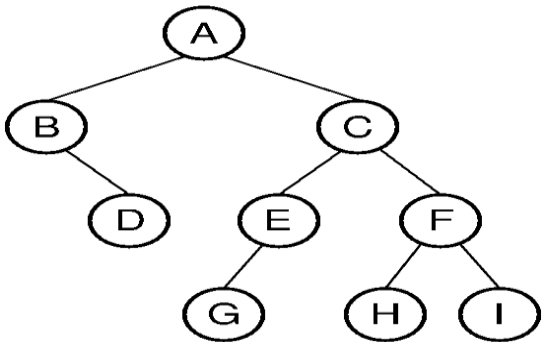
Week-5	MINIMUM COST SPANNING TREE

Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal‘s algorithm.



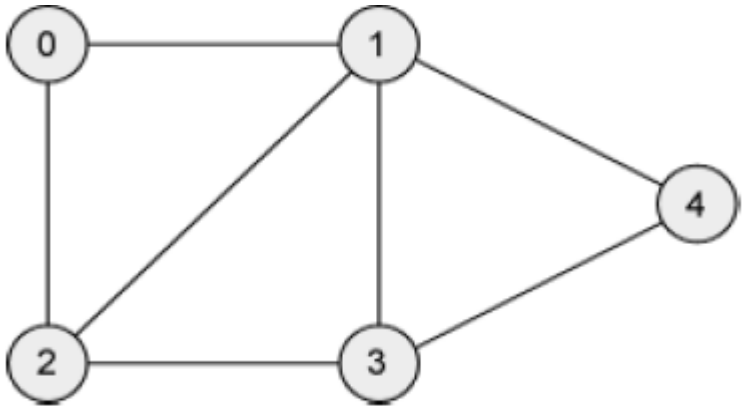
Week-6	TREE TRAVESRSALS

Perform various tree traversal algorithms for a given tree.

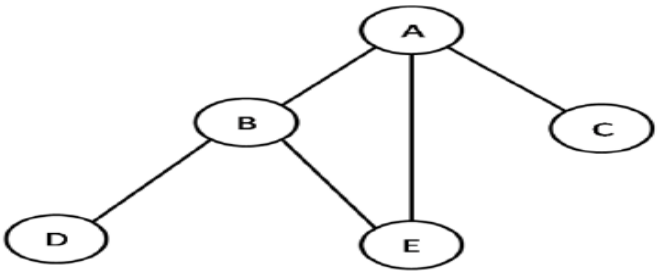


Week-7	GRAPH TRAVERSALS

a. Print all the nodes reachable from a given starting node in a digraph using BFS method.



b. Check whether a given graph is connected or not using DFS method.



Week-8	**SUM OF SUB SETS PROBLEM**

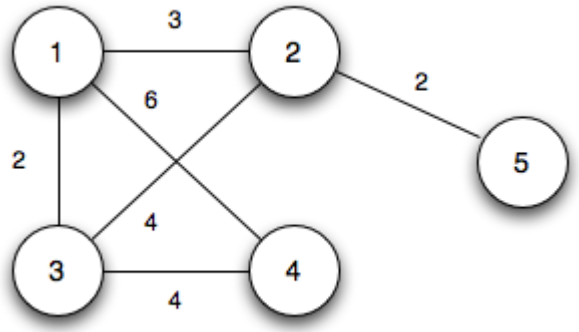
Find a subset of a given set S = {sl, s2,....., sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1, 2, 6} and {1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

Week-9	**TRAVELLING SALES PERSON PROBLEM**

Implement any scheme to find the optimal solution for the Traveling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation

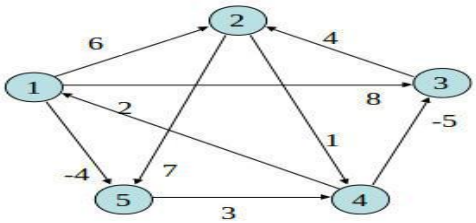
Week-10	**MINIMUM COST SPANNING TREE**

Find Minimum Cost Spanning Tree of a given undirected graph using Prim‘s algorithm.



Week-11	ALL PAIRS SHORTEST PATHS

Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.



	1	2	3	4	5
1	0	6	8	∞	-4
2	∞	0	∞	1	7
3	∞	4	0	∞	∞
4	2	∞	-5	0	∞
5	∞	∞	∞	3	0

Week-12	N QUEENS PROBLEM

Implement N Queen's problem using Back Tracking.

Reference Books:

1. Levitin A, —Introduction to the Design and Analysis of Algorithms‖, Pearson Education, 2008.
2. Goodrich, M.T. R Tomassia, —Algorithm Design foundations Analysis and Internet Examples‖, John Wiley and Sons, 2006.
3. Base Sara, Allen Van Gelder, —Computer Algorithms Introduction to Design and Analysis‖, Pearson, 3rd Edition, 1999.

Web Reference:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html