

Q1. a) Write an algorithm for Longest Common Subsequence Problem using Dynamic Programming. Explain the algorithm using an example.

b) Write an algorithm for 4-queen Problem using Backtracking. Queens are placed on the chessboard and they should not attack each other as per the normal rules of the chess game. There are no other pieces on the board except the queens. Give proper comments and draw a solution diagram.

Q.2 a) We have a number of sorted lists and we want to create a single sorted list by combining all the lists. Order of lists to be merged makes a lot of difference. E.g. if we are given sorted lists A,B,C of size 100,200 and 300 each then it will make a difference that whether we combine A,B or A,C or B,C first and so on. Optimal choice will reduce the number of comparisons required. The Problem is known as optimal merge patterns.

Write a Program for Optimal Merge Patterns. You are given a list of size m containing the lengths of lists to be merged together. Output should give pairs of lists to be merged (One pair in one line followed by second pair in second line and so on)

b) Write an algorithm for 0/1 knapsack problem using dynamic programming. Your algorithm should take an input of n items with their weights and profits and a Total Knapsack weight W. Output should give a list of items to be included in the knapsack. Also workout the following example with the help of the algorithm where the total knapsack weight allowed is 8.

Items	A	B	C	D	E
Weight	1	2	3	4	3
Total Profit	40	60	30	80	90

Q.3 Answer any four of the following

a) What is parallelism? How the limits of parallelism are defined. How we will decide the number of parallel processors to be used for a task.

b) Write a comparative study of three algorithms for shortest path algorithms namely Dijkstra, Bellman ford, Floyd-Warshall.

c) Prove the 2-approximation algorithm for vertex cover.

d) Differentiate between deterministic and non-deterministic polynomial time algorithm.

e) Differentiate between Euler and Hamiltonian Circuit. Draw four graphs which is i) Euler and Hamiltonian ii) Euler not Hamiltonian iii) Hamiltonian not Euler iv) Neither Euler nor Hamiltonian Highlight the respective circuit in the graphs, if exists.

f) Describe Master Theorem for calculating the complexity of Divide and Conquer Problems.

Q.4 A given string of length n is to be rotated by m positions. For example if the string “approximation” is rotated by 4 then it will become “oximationappr”.

This problem which is very frequent in many applications and there are many different algorithms available to solve Write three different algorithms for solving this problem. All three algorithms should use entirely different approach. Also explain the working of each algorithm.

Note: If you write only one correct algorithm it will be evaluated for 2 marks. If you write two correct algorithms these will be evaluated for 5 marks. If you write all the three algorithms then these will be evaluated for 10 marks.