# Design and Analysis of Algo-SIMP QUESTIONS-22

Module-1

1. Define algorithm. What are the criteria that an algorithm must satisfy?
2. Write an algorithm to find the maximum element in an array of n elements. Give the mathematical analysis of this non recursive algorithm.
3. Explain the following types of problems (a)Combinatorial problems (ii)Graph Problems (iii)Geometric problems (iv)Sequencing (v)Sorting
4. Write the tower of hanoi algorithm and steps for analysis of recursive algorithm, show the analysis of the algorithm (Practice similar type questions/problems)
5. Explain asymptotic notation with example
6. Explain the following with ex (i)How a new variable is counted in a program (ii)Representation of graph (iii)Fundamental data structures -15M

Module-2

1. Design merge sort algorithm. Write a descriptive note on its best case, average case, and worst-case time efficiency.
2. Discuss Strassen's matrix multiplication with an example. and derive its time complexity(Practice similar type questions/problems)
3. Explain divide and conquer algorithm with its adv and disadv, Compare straight forward method and divide and conquer method for finding max and min elements of the list
4. Apply a quick sort algorithm to sort the list E, X, A, M, P, L, E in alphabetical order. Draw the tree of recursive calls made(Practice similar type questions/problems)
5. Design an algorithm for performing quick sort, apply the same to sort the following set of numbers - 5,2,4,6,3,1,7,8 (Practice similar type questions/problems)
6. Define topological sorting. Illustrate the topological sorting using the DFS method
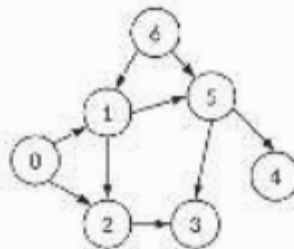
(practice similar type questions)

Module-3

1. Define minimum cost spanning tree. Write Prim's algorithm to find minimum cost spanning tree for the given weighted connected graph
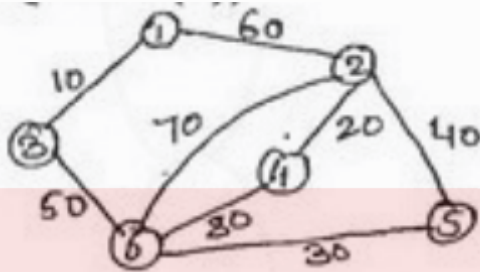

(Practice similar type questions/problems)

2. Obtain the Huffman tree and the code for the following data

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

Encode the words DAD and BAD (Practice similar type questions/problems)

3. Solve the following instance of greedy knapsack problem where n=4, m=10, p = (40, 42, 25, 12) and w = (4, 7, 5, 3) (Practice similar type questions/problems)

4. Write the problem statement for job sequencing with a deadline? Let n=5, profits (10, 3, 33, 11, 40) and deadlines (3, 1, 1, 2, 2). Find the optimal sequence of execution of job solution using greedy algorithm

(Practice similar type questions/problems)

5. What is dijkstra's algorithm used for? Apply dijkstra's algorithm for the following graph, Given 1 is the source node, What are the distances of shortest paths from source node to all other nodes (Practice similar type questions/problems)
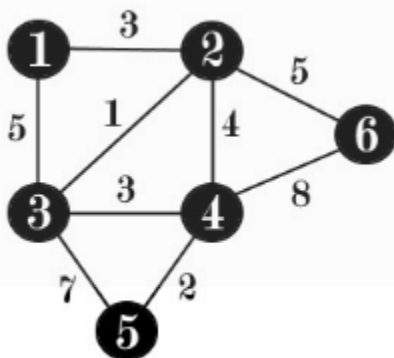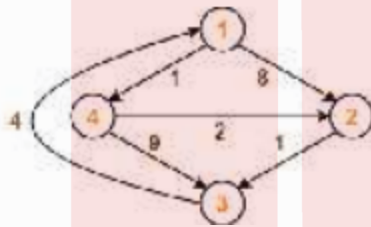

6. Explain bottom up heap construction with an example

Module-4

1. Define transitive closure. Write Warshall's algorithm to compute transitive closure. Apply the same to find the transitive closure of the digraph given below (Practice similar type questions/problems)
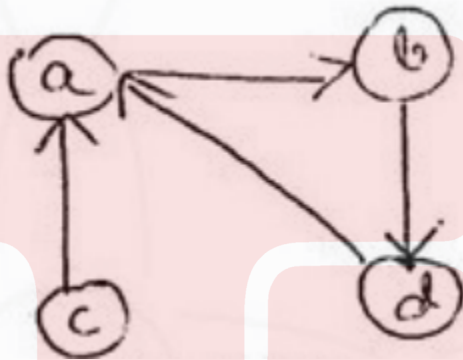
2. Apply Floyd's algorithm to find all pairs shortest path for the graph given below.

(Practice similar type questions/problems)
3. Explain multistage graph with an ex, Write backward multistage graph algorithm, also explain the technique of finding the minimum cost in a multistage graph
4. Explain the following (i)Negative weight cycle in DG (ii)Advantages of Optimal binary tree
5. Construct optimal binary tree for the following (Practice similar type questions/problems)

Keys	A	B	C	D
Probability	0.1	0.2	0.4	0.3

6. Design an algorithm to solve knapsack problem using dynamic programming, apply the same to solve the following knapsack problem where w=50 (Practice similar type questions/problems)

| Item	Weight	Value
A	10	60
B	20	100

C	30	120

Module-5

1. Write a short note on the following
   (i)P (ii)NP (iii)NP-Complete (iv)NP-Hard class problems (v)Tractable and intractable problems (vi)Non deterministic algorithm
2. Apply branch and bound method for knapsack problem C=10(Practice similar type questions/problems)

Items	1	2	3	4
Weights	4	7	5	3
Values	$40	$32	$25	$12

3. What is backtracking, list out its advantages, Considering 4-queen problem, provide two possible solutions to this problem using backtracking
4. Solve the given instance of the sum of subset problems s={3,5,6,7} and d=15. Construct a state space tree (Practice similar type questions/problems)
5. With the help of a state space tree. Solve the Traveling Salesman Problem for the
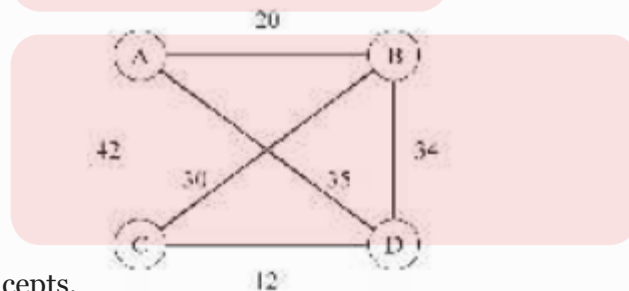
following graph using branch and bound concepts.