Analysis & Design of Algorithms

Q1. Write and explain different types of asymptotic notations with example.

Q2. What is a recurrence relation? Solve the following relation by recurrence tree method

$T(n) = 2\,T(n/2) + n^2$

Q3. Explain the algorithm of Merge sort and compare its space complexity with Quick sort.

Q4. What is dividing and conquer strategy? Design a recursive binary search algorithm using divide and conquer strategy. Also give its recurrence relation.

Q5. Write and explain Prim's algorithm to find the minimum spanning tree from a graph with example and divide its time complexity.

Q6. Consider three item along with their respective weights and profits:

W_i = (18,15,10)

P_i= (25,24,15)

The Knapsack has capacity m=20. Find out the solution to the fractional knapsack problem using greedy method.

Q7. Differentiate between Greedy and Dynamic programming method with suitable example.

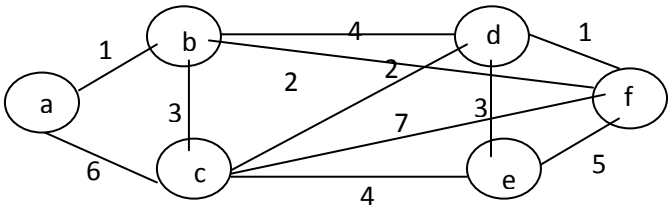
Q8. Write and explain All pair shortest path algorithm with suitable example and drive its time complexity.

Q9. Discuss branch and bound strategy by solving any instance of 0/1 knapsack problem and analyze the time complexity for the same.

Q10. Differentiate between backtracking and branch and bound method.

Q11. Discuss N-Queens problem and analyze the time complexity if the same.

Q12. Find the minimum spanning tree using krushkal algorithm of the following graph:



Q13. Consider the Knapsack instance :

Number of object n = 3 with corresponding weight and profit as

W_i= (2,3,4)

P_i= (1,2,5)

The knapsack capacity m = 6. Using dynamic approach find the solution for this instance of 0/1 knapsack problem.

Q14. Explain the following

1. Heap sort
2. Graph coloring problem
3. Transitive closure of graph.

Q15. Explain Np Hard and Np complete Problem with example.

Q16. Explain cookes theorem in detail.

Q17. Write and explain kruskal algorithm to find minimum spanning tree from a graph with example and rive its complexity.

Q18. Differentiate between backtracking and branch and bound method.

Q19. Explain heap sort with its complexity? What is running time of heap sort when list is already sorted? Sort the following list using heap sort:

14,8,15,6,3,20,22,28,10,40

Q20. Write and explain algorithm for finding TRANSITIVE CLOSURE using Dynamic approach with suitable example.

Q21. Discuss branch and bound strategy by solving Travelling salesman problem for any graph and analyze time complexity.

Q22. Give an algorithm for graph coloring problem using Back tracking and analyze the time complexity of the same.

Q23. Explain the following

1. Adjacency list and Adjacency Matrix representation of graph
2. Optimal binary search tree
3. Np-Complete Problem.

Q24. Explain the implementation of Priority queue using max-heap? Give the procedure for HEAP_INSERT and HEAP_EXTRACT-MAX for implementation of Priority Queue? Give their time complexity.

Q25. Explain recurrence relation with the help of an example. Explain Master theorem and Substitution method with the help of an example.

Q26. Explain single source shortest path in Greedy approach with its algorithm.

Q27. Explain All pair shortest path in Dynamic programming and also explain its algorithm.

Q28. What is meant by strongly connected component of a graph? How can the number of strongly connected component of a graph change if a new node is added?

Q29. Discuss Dijkstra's algorithm. Also illustrate how running time of algorithm is affected by representation of Graph.

Q30. What is meant by optimal binary search tree? Write an algorithm to convert OBST. Also compare w (I,j), r(I,j) and c(I,j) for the identifier set (a1, a2,a3,a4) = (do, if, print, stop) with

P(1:4) = (3,3,1,1) and

Q(0:4) = (2,3,1,1). Using the r(I,j) construct the optimal binary search tree.