53 (CS 503) DAAL

2013

(May)

DESIGN AND ANALYSIS OF ALGORITHMS

Paper : CS 503

Full Marks : 100

Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Discuss the basic asymptotic notations used for measuring the complexity of an algorithm. 9

   (b) State the algorithm for quick sort. 6

   (c) Derive the complexity of merge sort algorithm. 5

2. *(a)* State and explain the greedy algorithm. 6

(b) Given the capacity of the Knapsack $w = 20$ units, fill the Knapsack (with in the capacity) for 3 objects so that the accumulated profit is maximum. The individual profits of the objects are given by $(p_1, p_2, p_3) = (25, 24, 15)$ and their weights are $(w_1, w_0, w_3) = (18, 15, 10)$.
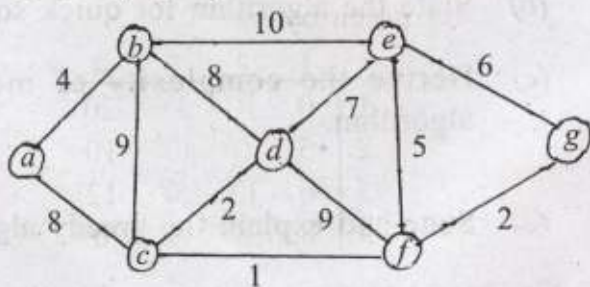
10

(c) Explain the problem of job sequencing with deadlines. 4

3. (a) Define a spanning tree. 2

(b) State the Kruskal's algorithm for constructing the minimum cost spanning tree. 8

(c) Use Prim's algorithm and find out the minimum cost spanning tree corresponding to the graph given below : 10

4. (a) Use the single source shortest path algorithm, to find out the shortest path from the source node A to all other nodes in the connected graph given below : **10**
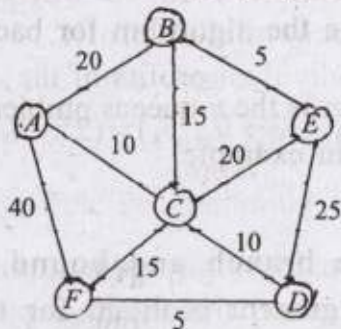
(b) Using travelling salesperson problem, find out the tour having minimum cost starting from vertex 1 and coming back to the same vertex for the given directed graph **10**
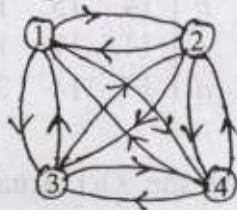
Cost adjacency matrix for the above graph is given by —

	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

5. (a) Explain how backtracking can be used to find the solution of a desired problem.

6

(b) State the algorithm for backtracking. 6

(c) Discuss the n-queens problem with the help of an example.

8

6. (a) Use branch and bound to solve the assignment problem for the given cost matrix

12

	1	2	3	4
a	11	12	18	40
b	14	15	13	22
c	11	17	19	23
d	17	14	20	28

(b) Solve the O/1 Knapsack problem for 4 objects, provided the maximum capacity of the Knapsack is 8 units, weights of the individual objects are given $(2, 3, 4, 5)$ respectively and their corresponding profits are $(3, 5, 6, 10)$ respectively.

8

7. (a) What do you mean by a decision problem ? State the algorithm for Knapsack decision problem. 2+6=8

(b) Discuss the following : 3×4=12

(i) NP-complete and NP-hard problems

(ii) Dynamic Programming

(iii) Graph colouring problem.

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