

UKA TARSADIA UNIVERSITY

B.Tech. (IT)/B.Tech. (CE) (5th Semester)

Subject : 030080503/030090503-Design and Analysis of Algorithms (Theory)

Time : 10 am to 1 pm

Duration : 3 Hours

Date : 22/11/2014
Max. Marks : 70.

Instructions:

1. Attempt all questions.
2. Write each section in a separate answer book.
3. Make suitable assumptions wherever necessary.
4. Figures to the right indicate full marks allocated to that question.
5. Draw diagrams/figures whenever necessary.

SECTION - 1

Q-1 (A) Do as directed.

[07]

- I) Mention the characteristics of an algorithm.
- II) Which are the different methods of analyzing the algorithms?
- III) Give two examples of elementary operation.
- IV) What is the average case time complexity of quick sort?
- V) Arrange the following growth rate of algorithm in increasing order.
 $2^n, n \log n, n^2, 1, n, \log n, n!, n^3$
- VI) Define minimum spanning tree.
- VII) Write down recurrence relation of Fibonacci series algorithm.

Q-1 (B) Answer the following in brief. (Any 4)

[08]

- I) Find the asymptotic tight bound for $f(n) = 6 * 2^n + n^2$. Also compute c and n_0 .
- II) Prove or disprove: $\max(f(n), g(n)) = \Theta(f(n) + g(n))$.
- III) Write down Divide and Conquer algorithm to compute x^n .
- IV) Explain Omega (Ω) notation with diagram.
- V) What are the differences between Kruskal's algorithm and Prim's algorithm?
- VI) Given n jobs J_1, J_2, \dots, J_n having execution deadlines d_1, d_2, \dots, d_n . Design an algorithm using greedy approach to schedule these jobs as per earliest deadline first.

J. Sch

Q-2 Answer the following.

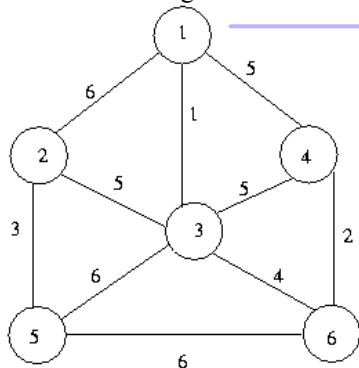
[10]

- A) Sort the list using Quick sort algorithm: $\langle 25, 15, 23, 16, 5, 1, 34, 11, 22, 12, 23 \rangle$.

OR

- A) Sort the list using Merge sort algorithm: $\langle 85, 24, 63, 45, 17, 31, 96, 50 \rangle$.

- B) Execute Prim's algorithm for the below graph to construct a Minimum Spanning Tree.



Prim's

OR

- B) Solve the following recurrence using Recursion Tree method.
 $T(n) = 2T(n/2) + n^2$

Rec Tree

Q-3 Answer the following in detail. (Any 2)

[10]

- A) Write down algorithms of sequential search and binary search. Compute their time complexity.

- B) Write down Kruskal's algorithm to construct Minimum Spanning Tree. Analyze the algorithm

Kruskal Algo

asymptotically.

- C) Given 6 jobs to be scheduled on a single processor. Job j requires t_j units of processing time and is due at time d_j . Job j starts at s_j and finishes at $f_j = s_j + t_j$. Lateness $l_j = \max\{0, f_j - d_j\}$. Schedule all the jobs on a single processor to minimize the lateness using greedy approach.

	j_1	j_2	j_3	j_4	j_5	j_6
t_j	3	2	1	4	3	2
d_j	6	8	9	9	14	15

Job Sch

SECTION - 2

Q-4 (A) Do as directed.

[07]

- Which method is used to solve n-queen problem?
- "A graph can have more than one spanning tree." Is this statement true or false? Justify the answer.
- Define Sparse graph.
- State MinMax Principle.
- Mention procedural parameters of backtracking.
- Mention the advantages of dynamic programming method.
- Define Path with respect to graph.

Q-4 (B) Answer the following in brief. (Any 4)

[08]

- Explain Articulation point with diagram.
- Mention any two differences between Breadth First Search and Depth First Search.
- The Shortest Path problem satisfies the Principle of Optimality. Justify this statement.
- State the differences between greedy approach and dynamic programming approach.
- Explain Finite Automata with diagram.
- Given an undirected graph with $n=7$ vertices. Calculate the minimum amount of storage required for adjacency matrix.

Q-5 Answer the following.

[10]

- A) Solve the following Knapsack problem using Dynamic Programming method.
Number of items $n = 4$ and capacity of knapsack $W = 5$.

Item	Weight (w)	Profit (p)
1	2	3
2	3	4
3	4	5
4	5	6

Knapsack < Backtracking

OR

- A) Design and analyze an algorithm to solve Knapsack problem using Backtracking.
- B) Given coins of denominations 2, 4, and 5 with amount to be paid is 7. Using Dynamic Programming approach, find out optimal number of coins and sequence of coins used to pay given amount.

OR

- B) Explain how to find out Longest Common Subsequence of two strings using Dynamic Programming method. Find the Longest Common Subsequence of given two strings $S_1 = 10010101$ and $S_2 = 010110110$.

Q-6 Answer the following in detail. (Any 2)

[10]

- Discuss Branch and Bound approach for an algorithm with an example.
- Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is $\langle 5, 10, 3, 12, 5, 50, 6 \rangle$.
- Discuss Depth-First Search along with its applications.

B&B