

PART-B

$$4 \times 15 = 60\text{M}$$

UNIT-I

1. a. What is an algorithm? Write an algorithm to find maximum of given ' n ' numbers. **6M**

- b. How do you calculate performance analysis of Time Complexity and explain with an example? **9M**

(or)

2. a. What is Big 'Oh' Notation? Explain. **5M**
- b. Explain different disjoint set operations with an example. **10M**

UNIT-II

3. a. Explain general method of divide and conquer. **3M**

- b. Explain the control abstraction procedure of greedy method. **4M**

- c. Write and explain Quick sort algorithm. **8M**

(or)

4. a. What is minimum cost spanning tree? Explain Prim's algorithm with an example. **9M**

- b. Explain single source shortest path problem with an example. **6M**

UNIT-III

5. What is 0/1 Knapsack problem? Explain how dynamic programming is used to solve 0/1 Knapsack? **15M**

(or)

6. a. Write recursive backtracking algorithm to solve sum of subsets problem. **7M**
- b. Discuss graph coloring problem and its time complexity. **8M**

UNIT-IV

7. Find optimal tour of travelling salesperson for the following cost matrix using LCBB. **15M**

$$\begin{pmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 16 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{pmatrix}$$

The cost matrix is

(or)

8. a. Write short notes on P and NP problems. **6M**
- b. State and prove Cook's theorem. **9M**



VR10

IT 5003

III/IV B.Tech. DEGREE EXAMINATION, DECEMBER, 2013

Fifth Semester

INFORMATION TECHNOLOGY

DESIGN AND ANALYSIS OF ALGORITHMS

Time : 3 hours

Max. Marks : 70

Part-A is compulsory

Answer One Question from each unit of Part-B.

PART-A

10 x 1 = 10M

- a. State principle of optimality.
- b. Define Weighting rule for Union.
- c. What is control abstraction?
- d. What is the difference between explicit and implicit constraints in backtracking?
- e. Define the basic principle of backtracking.
- f. What is Hamiltonian Cycle?
- g. What is an articulation point?
- h. What is the time complexity of Strassen's matrix multiplication?
- i. State Traveling salesperson problem.
- j. What is NP-Hard problem?

**IT 5003**

III/IV B.Tech. DEGREE EXAMINATION, NOVEMBER, 2014

Fifth Semester

INFORMATION TECHNOLOGYDESIGN AND ANALYSIS OF ALGORITHMS***Time: 3 hours******Max. Marks: 70******Part-A is compulsory******Answer One Question from each unit of Part-B*****PART-A*****10 x 1 = 10M***

- a. What is Big Oh notation?
- b. What is control abstraction?
- c. Define algorithm.
- d. What is the time complexity of Merge Sort?
- e. Define feasible solution.
- f. Define principle of optimality.
- g. Differentiate between Greedy method and Dynamic Programming.
- h. What are implicit constraints?
- i. What is a state space tree?
- j. What is a live node?

$$4 \times 15 = 60M$$

UNIT-I

1. a. Explain with examples about Space Complexity. **7M**
- b. Explain about various methods of finding Time Complexity. **8M**

(or)

2. a. Explain in detail about Disjoint Sets and Unions with relevant algorithms. **8M**
- b. Explain in detail about Bi-Connected Components. **7M**

UNIT-II

3. a. Write control Abstraction of Divide and Conquer technique. **5M**
- b. Write about Strassen's Matrix Multiplication and derive its complexity. **10M**

(or)

4. a. Write Kruskal's minimum cost spanning tree algorithm and explain with an example. **8M**
- b. Explain about Optimal Storage on tapes. **7M**

UNIT-III

5. a. Explain in detail about Dynamic Knapsack Problem. **8M**

- b. Write short notes on Backtracking. Generate the solution using backtracking to 4-queen problem. **7M**

(or)

6. a. Explain with algorithm about Hamiltonian Cycles problem. **8M**
- b. Explain in detail about Optimal binary search trees. **7M**

UNIT-IV

7. a. Explain about general method of Branch and Bound. **6M**
- b. Explain the solution for Travelling Sales Person problem using Branch and Bound. **9M**

(or)

8. a. Explain about NP-Hard and NP-Complete problems. **8M**
- b. Write about Cook's theorem. **7M**

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INFORMATION TECHNOLOGY

DESIGN AND ANALYSIS OF ALGORITHMS**Time: 3 hours****Max. Marks: 70****Part-A is compulsory****Answer One Question from each Unit of Part-B**PART-A**10 x 1 = 10M**

- a. What is Big oh notation?
- b. What is Space Complexity?
- c. Define Forest.
- d. Define divide and conquer method.
- e. What is bi-connected component?
- f. Define optimal solution.
- g. What is e-node and dead node?
- h. Define spanning tree.
- i. What is depth first searching technique?
- j. What are the two types of constraints used in backtracking?

IT 5003

PART-B

4 x 15 = 60M

UNIT-I

1. a. Define algorithm and what criteria an algorithm must satisfy? **4M**
- b. Write an algorithm to find sum of n elements recursively. Find its time complexity. **6M**
- c. Write short notes on Amortized analysis. **5M**

(or)

2. a. Write Find and Union algorithms. **8M**
- b. Explain the Disjoint set operations using trees. **7M**

UNIT-II

3. a. Derive the time complexity of Strassen's Matrix Multiplication. **7M**
- b. Write an algorithm of Binary Search and illustrate with an example. **8M**

(or)

4. a. Show how Merge sort sorts the following sequences of keys in ascending order. 12, 22, 30, 44, 47, 56, 57, 65, 75, 80 with a neat diagram representing sequence of recursion calls. **9M**
- b. Derive the time complexity of Merge sort. **6M**

IT 5003

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UNIT-III

5. a. What is the control abstraction for backtracking? **4M**
- b. What are the algorithm steps in solving n-queen problem? **5M**
- c. Write an algorithm of matrix chain multiplication. **6M**

(or)

6. Describe the Backtracking technique to m-coloring graph. Explain with an example. **15M**

UNIT-IV

7. a. Write short notes on Cook's theorem. **7M**
- b. Explain about NP-hard and NP-complete problems. **8M**

(or)

8. a. Explain the principles of FIFO & LC Branch and Bound. **8M**
- b. Describe the Traveling Salesperson Problem in Branch and Bound. **7M**

- b. Provide solution for 8-queens problem using backtracking approach. **7M**

UNIT-IV

8. a. Explain travelling sales person problem LCBB procedure with the following instance and draw the portion of the state space tree and find an optimal tour **10M**

∞	20	30	10	11
15	∞	16	4	2
3	5	∞	2	4
19	6	18	∞	3
16	4	7	16	∞

- b. Explain control abstraction for LC-Search. **5M**

(or)

9. a. State and prove Cook's theorem. **7M**

b. Explain relationship among P, NP, NP-Complete and NP-Hard problems. **8M**

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**VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)**

II/IV B.Tech. DEGREE EXAMINATION, OCTOBER, 2018
Fourth Semester

INFORMATION TECHNOLOGY

14IT3403 DESIGN AND ANALYSIS OF ALGORITHMS

Part-A is compulsory

Answer One Question from each Unit of Part-B

Answer to any single question or its part shall be written at one place only

PART-A

$$10 \times 1 = 10M$$

1.
 - a. Define articulation point.
 - b. Write weighting rule union of two sets i and j.
 - c. Give time complexity of Strassen's matrix multiplication.
 - d. Write number of comparisons required to merge two sorted lists with size m and n.
 - e. Define principal of optimality.
 - f. Write differences between greedy approach and dynamic programming approach.
 - g. Write control abstraction of divide and conquer approach.
 - h. Write implicit and explicit constraints in 8-Queens problem.
 - i. Define
 - i) State Space tree
 - ii) Dead Node
 - j. What is nondeterministic algorithm?

PART-B**4 x 15 = 60M****UNIT-I**

2. a. Write an algorithm for Fibonacci numbers up to n and give its time complexity in asymptotic notation. **7M**
- b. Describe advantage of weighting union rule over simple union operation on two sets. **8M**
(or)
3. a. Write short notes on Asymptotic notations. **5M**
- b. For the below given graph in fig.(1), identify the articulation points and draw the biconnected components. **10M**

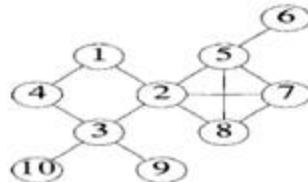


fig.(1)

UNIT-II

4. a. Solve the recurrence relation $T(n) = 2T(n/2)+n$, $T(1) = 1$. **5M**
- b. Illustrate with an example how merge sort is implemented? **10M**
(or)
5. a. Write an algorithm to find minimum cost spanning tree. Suppose the edges are sorted according to non-decreasing order of their costs and stored in a list. If there are N nodes in the input graph

then will the first $N-1$ edges of this list always be part of the minimum spanning tree. Justify your answer? **8M**

- b. Obtain a set of optimal Huffman codes for the messages (M_1, \dots, M_7) with relative frequencies $(q_1, \dots, q_7) = (4, 5, 7, 8, 10, 12, 20)$. Draw the decode tree for this set of codes. **7M**

UNIT-III

6. a. Find solution to the Knapsack using Dynamic programming $n=4$, $m=7$, $(p_1, p_2, p_3, p_4) = (1, 4, 5, 7)$ and $(w_1, w_2, w_3, w_4) = (1, 3, 4, 5)$. **7M**
- b. Write an algorithm to compute all pair shortest path and compute shortest paths for graph shown in fig. (2). **8M**

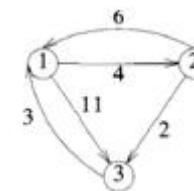


fig.(2)

(or)

7. a. Write recursive backtracking algorithm for Hamiltonian cycle of a given graph and find hamiltonian cycle for the graph shown in fig.(3). **8M**

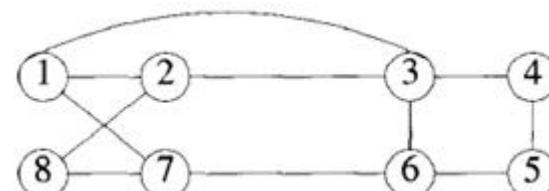


fig.(3)

**VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)**

II/IV B.Tech. DEGREE EXAMINATION, MARCH/APRIL 2019
Fourth Semester

INFORMATION TECHNOLOGY

14IT3403 DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 hours

Max. Marks: 70

Part-A is compulsory

Answer One Question from each Unit of Part - B

Answer to any single question or its part shall be written at one place only

PART-A

10 x 1 = 10M

1. a. Define the term time complexity.
 b. What is the time complexity of quick sort?
 c. What are optimal merge patterns?
 d. What is fixed tuple size formulation?
 e. What is a non-deterministic algorithm?
 f. Define breadth first search.
 g. Define explicit and implicit Constraints.
 h. Define general abstraction of backtracking.
 i. Define graph coloring.
 j. Give an example to NP complete.

PART-B**4 x 15 = 60M****UNIT-I**

2. a. Explain the usefulness of the following fundamental operations on sets: **8M**

i) FIND ii) DELETE
 iii) UNION iv) INSERT

- b. Write an algorithm for Depth First Search traversal and illustrate with an example. **7M**

(or)

3. a. Discuss with an example how graphs are represented? **8M**
 b. Write notes on spanning trees and connected components. **7M**

UNIT-II

4. a. By applying divide and conquer strategy, write a recursive algorithm for finding the maximum and the minimum element from a list. **5M**

- b. Discuss the time complexity of merge sort. **5M**

- c. Show how merge sort sorts the following sequences of keys in ascending order 12, 22, 33, 44, 48, 56, 57, 65, 76, 84 with a neat diagram representing sequence of Recursion calls? **5M**

(or)

5. a. Explain the control abstraction of Greedy Method. Write Kruskals algorithm that generates minimum spanning tree for every connected undirected graph? **8M**
- b. Explain how Greedy method helps to solve single source shortest path problem? **7M**

UNIT-III

6. a. Describe 0/1 knapsack problem and how to solve it using dynamic programming with an example? **8M**
- b. Discuss about sum of subsets problem. **7M**
- (or)
7. a. Explain the 8-queens problem using backtracking and write the algorithm. **8M**
- b. Elaborate the concept of graph coloring. **7M**

UNIT-IV

8. a. Describe the travelling sales person problem in Branch and Bound. **7M**
- b. Describe the principles of FIFO and LC branch and bound. **8M**
- (or)
9. a. What are P, NP, NP-Hard and NP-complete classes? Give relationship between them. **8M**
- b. Briefly discuss about Cook's Theorem. **7M**

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VR14

Reg. No:

**VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)**

II/IV B.Tech. DEGREE EXAMINATION, SEPTEMBER, 2020
Fourth Semester

INFORMATION TECHNOLOGY

14IT3403 DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 hours

Max. Marks: 70

Part-A is compulsory

Answer One Question from each Unit of Part - B

Answer to any single question or its part shall be written at one place only

PART-A

$$10 \times 1 = 10\text{M}$$

1.
 - a. Define an algorithm.
 - b. What is Omega notation?
 - c. Define Binary Search.
 - d. Give time complexity for Merge sort.
 - e. What is backtracking?
 - f. What is meant by optimal solution?
 - g. What is Graph coloring?
 - h. Define Cook's theorem.
 - i. What is non-deterministic algorithm?
 - j. Give two examples for NP-Class problems.

PART-B**4 x 15 = 60M****UNIT-I**

2. a. Discuss about various methods of Time Complexity. **8M**
b. Write a Recursive algorithm for Towers of Hanoi problem and Derive its time complexity. **7M**

(or)

3. a. Define a graph. Write short notes on graph representation. **7M**
b. Discuss and demonstrate Breadth First Search traversal. **8M**

UNIT-II

4. a. Write and explain Control abstraction of Greedy method. **6M**
b. Explain Merge sort technique and derive its time complexity. **9M**

(or)

5. Explain about various Minimum cost spanning tree algorithms.
15M

UNIT-III

6. What is Multi-stage graph? Explain Multi stage graph with suitable example. **15M**

(or)

7. a. Write short notes on backtracking and develop recursive backtracking algorithm. **7M**
b. Construct state space tree for Hamiltonian cycles, with an example. **8M**

UNIT-IV

8. a. Write control abstraction for LC search. **7M**
b. Explain in detail about FIFO branch and bound. **8M**

(or)

9. a. List and explain different NP-complete problems. **8M**
b. Explain briefly about Travelling salesperson problem. **7M**

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VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE

(AUTONOMOUS)
II/IV B.Tech. DEGREE EXAMINATION, NOVEMBER, 2019
Fourth Semester
INFORMATION TECHNOLOGY
17IT3403 DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 hours *Max. Marks: 70*

Part-A is compulsory

Answer One Question from each Unit of Part-B

Answer to any single question or its part shall be written at one place only

PART-A

10 x 1 = 10M

1. a. Check whether $F(n) = 2n + n$ is in Big-oh.
 b. What is the height of the binary tree?
 c. Define the basic principle of Divide-and-Conquer Design technique.
 d. Give the time complexity of merge sort.
 e. Mention the various algorithms to find spanning trees.
 f. Consider the following algorithm and answer the question given below,

ALGORITHM *Enigma(A[0..n - 1, 0..n - 1])*

//Input: A matrix A[0..n - 1, 0..n - 1] of real numbers

```
for i  $\leftarrow$  0 to n - 2 do
    for j  $\leftarrow$  i + 1 to n - 1 do
        if A[i, j]  $\neq$  A[j, i]
            return false
return true
```

What does this algorithm compute?

- g. Define Hamiltonian cycle.
- h. What is Multistage graph problem?
- i. Mention the principle of backtracking.
- j. What is LC branch and bound?

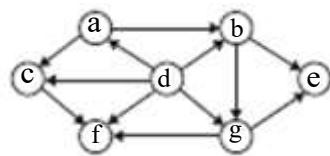
PART-B**4 x 15 = 60M****UNIT-I**

2. a. Evaluate $(F_6 + F_9)^2 * (F_{11}-F_5)^3$ recursively using Fibonacci number. **10M**

- b. What are the characteristics of an algorithm? **5M**

(or)

3. Describe about the graph traversal techniques. Give the DFS and BFS for the following directed graph. **15M**

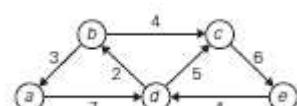
**UNIT-II**

4. Explain binary search with a detailed subroutine? Also, search an element '3' using binary search in the given element **15M**

6 2 8 3 5 1 4 2 3

(or)

5. Solve the following instances of the single source shortest path problem with vertex 'a' as source vertex. **15M**

**UNIT-III**

6. a. Discuss about graph coloring problem. **8M**
- b. Explain travelling salesman problem as an example of approximation algorithm. **7M**

(or)

7. Apply backtracking to solve the following instance of the subset sum problem: A = {12, 34, 45, 67} and d = 113. **15M**

UNIT-IV

8. a. What is LC search method? Describe the central abstraction of LC search. **8M**
- b. Describe how 0/1 knapsack problem is solved using branch and bound techniques? **7M**

(or)

9. Write a note on the following:
- a. Non-deterministic algorithms **5M**
- b. NP Hard and NP Complete **5M**
- c. Cook's theorem **5M**

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II/IV B.Tech. DEGREE EXAMINATION, MAY, 2016

Fourth Semester

INFORMATION TECHNOLOGY

DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 hours

Max. Marks: 70

Part-A is compulsory

Answer One Question from each Unit of Part-B

PART-A

10 x 1 = 10M

1. a. Define time complexity of an algorithm.
- b. What is the complexity of merge sort?
- c. What is pseudo code?
- d. Define disjoint set.
- e. Explain huffman codes.
- f. Name the data structure used while traversing a graph using Depth First Search.
- g. What is spanning tree?
- h. What is N-Queens problem?
- i. Define backtracking.
- j. Define NP-complete.

PART-B**4 x 15 = 60M****UNIT-I**

2. a. Explain performance analysis of an algorithm. **7M**
 b. Write an algorithm to find largest of 'n' numbers and derive its time complexity using Big 'Oh' notation. **8M**

(or)

3. a. Define graph. Explain Adjacency Matrix representation by illustrating with an example. **6M**
 b. Write a pseudo code for finding the strongly connected components of directed graph and analyze its time complexity. **9M**

UNIT-II

4. a. Write the binary search algorithm and trace it by illustrating with an example. **7M**
 b. Explain Quick sort algorithm and derive its time complexity. **8M**

(or)

5. a. Compare and contrast divide and conquer approach with greedy approach. **6M**
 b. Explain Prim's algorithm with suitable example. **9M**

6. a. Solve 0/1 knapsack problem using dynamic programming **8M**
 $n = 3, m = 6, (P_1, P_2, P_3) = (1, 2, 5), (W_1, W_2, W_3) = (2, 3, 4)$

- b. Explain multistage graph problem using dynamic programming with suitable example. **7M**

(or)

7. a. $m = 35$ and $W = \{15, 7, 20, 5, 18, 10, 12\}$. Find all possible subsets of W . Draw the portion of the state space tree. **8M**
 b. Write an algorithm of finding all m -colorings of a graph. **7M**

UNIT-IV

8. Describe Traveling Salesperson problem in Branch and Bound and solve the following traveling salesperson problem. **15M**

∞	20	30	10	11
15	∞	16	4	2
3	5	∞	2	4
19	6	18	∞	3
16	4	7	16	∞

(or)

9. a. Define branch and bound and write control abstraction for LC-Search. **7M**
 b. State and prove Cook's theorem. **8M**

II/IV B.Tech. DEGREE EXAMINATION, APRIL, 2017

Fourth Semester

INFORMATION TECHNOLOGY**DESIGN AND ANALYSIS OF ALGORITHMS****Time: 3 hours****Max. Marks: 70*****Part-A is compulsory******Answer One Question from each Unit of Part-B*****PART-A** **$10 \times 1 = 10M$**

1. a. Define algorithm.
- b. What is a recurrence relation?
- c. Write a pseudocode to find greatest of three numbers.
- d. What is a state space tree?
- e. Write the time complexity of Quick Sort and Merge Sort.
- f. What is live node?
- g. Define Sum of subset problem.
- h. Compare backtracking and branch-and-bound.
- i. What is 4-queens problem?
- j. Define Cook's theorem.

PART-B**4 x 15 = 60M****UNIT-I**

2. a. Explain about Asymptotic Notations. **8M**
 b. Write a recursive algorithm to find sum of 'n' numbers. Discuss its time complexity. **7M**

(or)

3. a. Write about Sets and its operations. **7M**
 b. Write and explain Depth First Search and Traversal algorithm. **8M**

UNIT-II

4. a. Explain Merge sort algorithm with an example. **7M**
 b. What is divide and conquer technique? Write recursive and iterative procedures for binary search. **8M**

(or)

5. a. What is minimum cost spanning tree? Write Prim's algorithm to find minimum cost spanning tree. **8M**
 b. Write about Single source shortest path problem. **7M**

UNIT-III

6. a. Write about Dynamic programming and Backtracking techniques. **7M**

- b. Write about Optimal Binary Search Tree. **8M**

(or)

7. a. Explain Travelling salesperson problem using Dynamic programming. **8M**
 b. What is backtracking? Explain Hamiltonian cycles. **7M**

UNIT-IV

8. What is Branch and Bound technique? Explain 0/1 knapsack problem using Branch and Bound technique. **15M**

(or)

9. a. Write and explain control abstraction for Least cost search method. **8M**
 b. What is non-deterministic algorithm? Explain. **7M**

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14IT3403

9. a. State and prove 3-satisfiability problem is NP-complete. **8M**
- b. Write short notes on the non deterministic algorithms. **7M**

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VR14

Reg. No:

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)

II/IV B.Tech. DEGREE EXAMINATION, APRIL, 2018

Fourth Semester

INFORMATION TECHNOLOGY

14IT3403 DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 hours

Max. Marks: 70

Part-A is compulsory

Answer One Question from each Unit of Part - B

Answer to any single question or its part shall be written at one place only

PART-A

10 x 1 = 10M

1. a. Which one is bigger either 2^n or n^2 ?
b. What is theta (θ) notation?
c. Define bi-connected component.
d. Write any two characteristics of Greedy algorithm.
e. What is the time complexity of binary search?
f. What is E-node?
g. List the applications of travelling salesperson problem.
h. State m-colorability decision problem.
i. State Cook's theorem.
j. Compare the backtracking method with branch and bound technique.

PART-B **$4 \times 15 = 60M$** **UNIT-I**

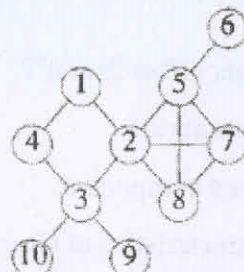
2. a. Explain various asymptotic notations used in algorithm design in detail. **8M**

- b. Write an algorithm to find sum of 'n' elements recursively and give its time complexity. **7M**

(or)

3. a. Explain articulation points and bi-connected components. **8M**

- b. Find articulation points in the following graph **7M**

**UNIT-II**

4. a. Explain Strassens's matrix multiplication. Comment on its time complexity. **8M**

- b. Explain general method of divide and conquer. Does the divide and conquer strategy always provides solution for all problems? **7M**

(or)

5. a. Write short notes on Optimal Merge Patterns. **8M**
- b. Sort the following list of elements using quick sort **7M**
- 85, 24, 63, 45, 17, 31, 96, 50, 13, 28

UNIT-III

6. Construct the optimal binary search tree for the following data. Let $n = 4$, $(a_1, a_2, a_3, a_4) = (\text{do}, \text{if}, \text{int}, \text{while})$, $p(1 : 4) = (3, 3, 1, 1)$ and $q(0 : 4) = (2, 3, 1, 1, 1)$. **15M**

(or)

7. Design a backtracking search algorithm for N-queens problem. Find the positions of 4 queens on a 4×4 chessboard. **15M**

UNIT-IV

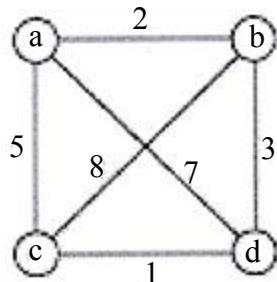
8. State travelling salesperson problem. Apply Branch and Bound algorithm to solve the TSP instantiated by the following cost matrix. **15M**

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

(or)

9. Solve the following Travelling Sales Person Problem using branch and bound technique and draw the solution state space tree.

15M



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VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)

II/IV B.Tech. DEGREE EXAMINATION, APRIL, 2019
Fourth Semester

INFORMATION TECHNOLOGY

17IT3403 DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 hours

Max. Marks: 70

Part-A is compulsory

Answer One Question from each Unit of Part - B

Answer to any single question or its part shall be written at one place only

PART-A

10 x 1 = 10M

1. a. Determine the time complexity for the given algorithm:

$$\text{Sum (a, n)} \\ \{ \quad s = 0 \\ \quad \text{for } i = 1 \text{ to } n \text{ do} \\ \quad \quad s = s + a[i] \\ \quad \text{return } s; \quad \}$$
- b. Define spanning tree.
- c. Sort the following using quick sort - 4, 1, 3, 5, 2.
- d. What is the time complexity of binary search?
- e. What is Strassen's matrix multiplication?
- f. Name the algorithm to find single source shortest path problem.
- g. Define graph coloring.
- h. Give the principle of Greedy algorithm.
- i. How branch and bound technique differs from backtracking?
- j. What is NP-hard problem?

PART-B**4 x 15 = 60M****UNIT-I**

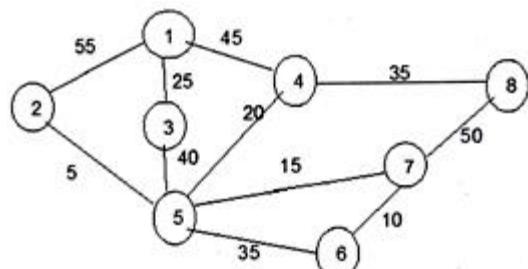
2. a. Define recurrence relation. **2M**
 b. Solve the following recurrence relation **8M**
 $T(n) - 4T(n - 1) + 3T(n - 2) = 0, \quad T(0) = 0, T(1) = 2$
 c. Write the non-recursive algorithm for finding the largest element of a given list. **5M**

(or)

3. a. What is binary tree and list its properties? **2M**
 b. Discuss various binary tree traversal methods. **7M**
 c. Discuss about Find and Union algorithms. **6M**

UNIT-II

4. a. Develop the general method for Divide and Conquer technique. **5M**
 b. Find minimum cost spanning tree for the following graph using Prim's algorithm. What its time complexity? **10M**



(or)

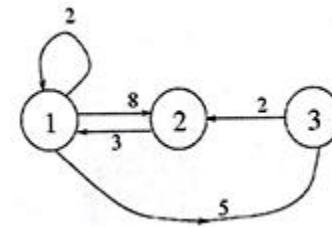
5. a. Which are $O(n \log n)$ sorting algorithms? **2M**
 b. Write and illustrate any one $O(n \log n)$ algorithm with detailed steps. **13M**

UNIT-III

6. a. Demonstrate the 8 queen problem with neat steps. **9M**
 b. Discuss about the control abstraction of backtracking. **6M**

(or)

7. Develop an algorithm for All-pairs shortest path problem and compute All-pairs shortest paths of the following graph using Floyd's algorithm. **15M**

**UNIT-IV**

8. a. Write the control abstraction for LC-Search. **6M**
 b. Discuss about FIFO branch and bound solution. **9M**

(or)

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**VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(AUTONOMOUS)**

II/IV B.Tech. DEGREE EXAMINATION, NOVEMBER, 2020

Fourth Semester

INFORMATION TECHNOLOGY

17IT3403 DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 hours

Max. Marks: 70

Part-A is compulsory

Answer One Question from each Unit of Part-B

Answer to any single question or its part shall be written at one place only

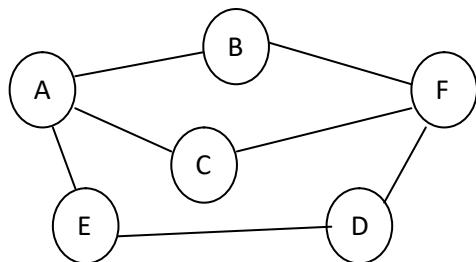
PART-A

$$10 \times 1 = 10M$$

1.
 - a. What is algorithm and define space complexity?
 - b. What is the time complexity of merge sort?
 - c. What is the general method of divide and conquer?
 - d. What is greedy method?
 - e. Write the time complexity of Strassen's matrix multiplication.
 - f. Define branch and bound method.
 - g. What are the problems comes under NP-hard?
 - h. State the sum of subsets problem.
 - i. What is 8-queens problem?
 - j. State the graph coloring problem.

PART-B **$4 \times 15 = 60M$** **UNIT-I**

2. a. Describe Union and Find algorithms with suitable examples. **6M**
 b. Illustrate BFS and DFS algorithms for the following graph. **9M**



(or)

3. a. Explain time complexity of an algorithm in detail. **7M**
 b. Describe the basic tree traversal algorithms with suitable examples. **8M**

UNIT-II

4. a. Write the algorithm for binary search technique and analyse its time complexity. **7M**
 b. Illustrate Prim's algorithm with your own example graph. **8M**

(or)

5. a. Write an algorithm for quick sort and analyse its time complexity. **10M**

- b. Explain about single source shortest path problem. **5M**

UNIT-III

6. a. Discuss about the multi-stage graph problem in dynamic programming. **5M**
 b. How do we find Hamiltonian cycles in a given graph? Illustrate with an example. **10M**

(or)

7. a. Find an optimal solution for 0/1 knapsack problem where $n = 5$, $m = 12$
 $(p_1, p_2, p_3, p_4, p_5) = (4, 8, 6, 7, 9)$ and $(w_1, w_2, w_3, w_4, w_5) = (2, 3, 1, 4, 1)$ **8M**
 b. Describe the general method of backtracking and solve 4-queens problem using backtracking method. **7M**

UNIT-IV

8. a. Describe the control abstractions for LC-search and compare branch and bound technique with backtracking. **8M**
 b. Define and explain the Cook's theorem. **7M**
- (or)
9. a. Explain the algorithm for travelling salesperson problem using branch and bound technique. **8M**