Code No: R1932053 **R19** **SET - 1**

III B. Tech II Semester Regular Examinations, June-2022

DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science and Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Define an algorithm. Describe the characteristics of an algorithm. [7M]
   b) Prove that: [8M]
      (i) $f(n)+g(n) = O(n^2)$ where $f(n)=3n^2-n+4$ and $g(n)= n \log n+5$
      (ii) $f(n) =4n^2 – 64n + 288 = \Omega(n^2)$.

(OR)

2. a) What are bi-connected components? Relate with suitable examples. [7M]
   b) Define Articulation point. For the following graph, in Fig.1, identify the articulation points and draw the bi-connected components. [8M]

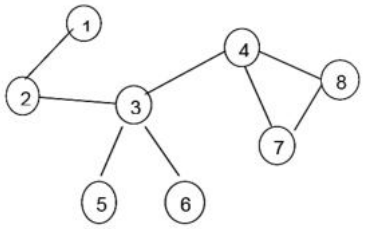

Fig.1

UNIT-II

3. a) Write algorithm for abstract Divide and Conquer strategy. Relate the method to real-time applications. [8M]
   b) Trace the quick sort algorithm to sort the list C, O, L, L, E, G, E in alphabetical order. [7M]

(OR)

4. a) Explain in the control abstraction for greedy method. List out the advantages. [7M]
   b) Prove that, if $p1/w1 \geq p2/w2 \geq \ldots\ldots \geq pn/wn$, then Greedy Knapsack generates an optimal solution to the given instance of the Knapsack problem. [8M]

UNIT-III

5. a) Define and describe Dynamic Programming. Give its applications. [8M]
   b) How the reliability of a system is determined using dynamic programming? Explain. [7M]

(OR)

6. a) Explain 0/1 Knapsack problem solution using Dynamic programming. [8M]
   b) Solve the following instance of 0/1 Knapsack problem using Dynamic programming n = 3; (W1, W2, W3) = (3, 5, 7); (P1, P2, P3) = (3, 7, 12); M = 4. [7M]

UNIT-IV

7. a) Give the solution to the 8-queens problem using backtracking. Draw the state space tree. [8M]
   b) Describe the algorithm for Hamiltonian cycles and determine the order of magnitude of the worst-case computing time for the backtracking procedure that finds all Hamiltonian cycles. [7M]

(OR)

8. a) Describe about Control Abstractions for LC-search. [7M]
   b) Explain the principles of [8M]
   (i) FIFO branch and Bound, and (ii) LC Branch and Bound

UNIT-V

9. a) Explain the satisfiability problem. [7M]
   b) How are P and NP problems related? Give the relation between NP-hard and NP problems. [8M]

(OR)

10. a) What is String Matching? Give its applications. [8M]
    b) Write about Naïve String Matching Algorithm. [7M]

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Code No: R1932053 **R19** **SET - 2**

III B. Tech II Semester Regular Examinations, June-2022

DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science and Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

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UNIT-I

1. a) Write the non-recursive algorithm for finding the Fibonacci sequence and derive its time complexity. [7M]
   b) Express the following function in Big Oh, Omega and theta notations: (i) $10n^2+5n$ and (ii) $10\log n+6$. [8M]

(OR)

2. a) Present an algorithm for depth first search traversal. Explain with an example. [8M]
   b) Consider the set of all trees of height h that can be constructed by a sequence of "union-by-height" operations. How many such trees are there? [7M]

UNIT-II

3. a) Write the Binary search algorithm and explain. [7M]
   b) Compare Merge sort and Quick sort complexities for the given data set: {10, 30, 15, 45, 25, 30, 35, 20, 30, 40, 50}. [8M]

(OR)

4. a) Explain the control abstraction for greedy method. [7M]
   b) Explain the Job sequencing with dead line algorithm and also find the solution for the instance n=7, (P1,P2,….,P7)=(3,5,20,18,1,6,30) and (D1,D2,…., D7)= (1,3,4,3,2,1,2). [8M]

UNIT-III

5. a) Explain Optimal Binary Search tree problem with an example. [7M]
   b) Design an algorithm to find solution for Optimal binary search tree. [8M]

(OR)

6. a) Write an algorithm of all pairs shortest path problem using dynamic programming. [8M]
   b) Find the shortest path between all pairs of nodes in the following Graph in Fig.1. [7M]

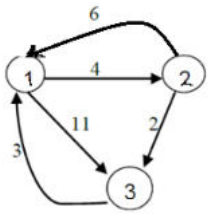

Fig.1

UNIT-IV

7. a) Explain the basic principle of backtracking and list the applications of backtracking. [8M]
   b) Explain how backtracking is used for solving n-queen's problem. Show the state space tree. [7M]

(OR)

8. a) What is branch and bound? Explain the role of bounding function in it using LC – search. [8M]
   b) Generate FIFO branch and bound solution for the given knapsack problem. m = 15, n = 3. (P1 P2 P3) = (10, 6, 8), (w1 w2 w3) = (10, 12, 3). [7M]

UNIT-V

9. a) Write short notes on Cook's theorem. [8M]
   b) Explain non deterministic algorithms. Give some examples. [7M]

(OR)

10. a) Write a short note on why KMP algorithm is most efficient algorithm for string matching. [8M]
    b) What are tries? Explain the algorithm for their formation. [7M]

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Code No: R1932053 **R19** **SET - 3**

III B. Tech II Semester Regular Examinations, June-2022

DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science and Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

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UNIT-I

1. a) Describe the Performance analysis in detail. [8M]
   b) Solve the following recurrence relation using substitution method: [7M]

$$T(n) = \begin{cases} 1, & n \le 4 \\ 2T(n) + \log n, & n > 4 \end{cases}$$

(OR)

2. a) What are the disjoint sets? Discuss about various disjoint set operations. [8M]
   b) Write short notes on Randomized algorithm. [7M]

UNIT-II

3. a) Give an algorithm for Merge sort. Derive it's time complexity. [7M]
   b) Perform merge sort on the array of elements a[1:10] = {310, 285, 179, 652, 351, 423, 861, 254, 450, 520}. Represent tree of calls for merge sort. [8M]

(OR)

4. a) Write Kruskal's algorithm to find the maximum spanning tree. [7M]
   b) Compute a minimum cost spanning tree for the following graph, shown in Fig.1, using Kruskal's Algorithm: [8M]

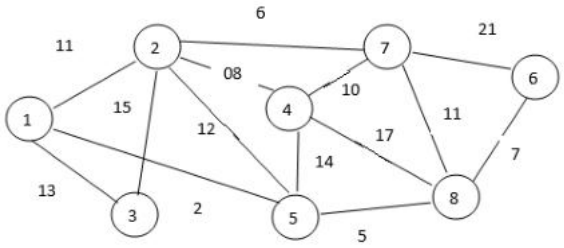

Fig.1

UNIT-III

5. a) Define and describe Dynamic Programming. Give its applications. [7M]
   b) Describe the problem of single–source shortest path and give a solution using dynamic programming. [8M]

(OR)

6. a) Write an Algorithm for 0/1 Knapsack problem using Dynamic programming. [8M]
   b) Describe the Matrix multiplication chains problem. Apply the recursive solution of dynamic programming to determine optimal sequence of pair wise matrix multiplications. [7M]

UNIT-IV

7. a) State and explain the subset sum problem with an example. [7M]
   b) Consider the following Sum of Subsets problem instance: n = 6, m = 30, and w[1:6] ={5, 10, 12, 13, 15, 18}. Find all possible subsets of w that sum to m. Draw the portion of the state space tree that is generated. [8M]

(OR)

8. a) State the concept of branch and bound method and also list its applications. [8M]
   b) Write short notes on FIFO and LC branch and bound. [7M]

UNIT-V

9. a) What are differences between NP-Hard and NP-Complete classes? Explain with examples. [8M]
   b) Explain any two problems of polynomial time algorithms. [7M]

(OR)

10. a) Explain the Rabin–Karp algorithm. What is its complexity? [8M]
    b) What are suffix trees? What are the applications of suffix trees? [7M]

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Code No: R1932053 **R19** **SET - 4**

III B. Tech II Semester Regular Examinations, June-2022

DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science and Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

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UNIT-I

1. a) What are the various Asymptotic notations? Bring out the importance of the same with suitable examples. [8M]

   b) What is the time complexity of following function fun ()? Explain [7M]

```
intfun(int n)
{
for (inti = 1; i<= n; i++)
{
        for (int j = 1; j < n; j += i)
{
Sum = Sum +i*j;
}
}
return(Sum);
}
```

(OR)

2. a) With the help of an algorithm explain the importance of weighted rule for Union operation? Represent a suitable tree for the same for an example. [8M]

   b) Write about Collapsing rule for Find operation. Give suitable example. [7M]

UNIT-II

3. a) Write the General method of Divide–and–Conquer approach. [7M]

   b) Explain the problem of finding minimum and maximum, and try to apply 'divide and conquer' strategy to solve it. Give a general algorithm for doing the same. [8M]

(OR)

4. a) Write Prim's algorithm to find the maximum spanning tree. [7M]

b) Compute a minimum cost spanning tree for the following graph, in Fig.1, using Prim's Algorithm: [8M]

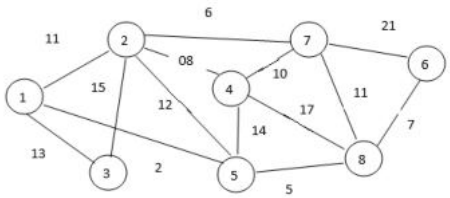

Fig.1

UNIT-III

5. a) Explain the methodology of dynamic programming. List the applications of dynamic programming. [8M]
   b) How the reliability of a system is determined using dynamic programming? Explain. [7M]

(OR)

6. a) What is Travelling Sales Person problem? And what are its applications? [7M]
   b) Find the shortest tour of a TSP for following instance using Dynamic programming: [8M]

	A	B	C	D
A	0	10	15	20
B	5	0	9	10
C	6	13	0	12
D	8	8	9	0

UNIT-IV

7. a) Define the method of backtracking with suitable example. [7M]
   b) What is graph coloring? Present an algorithm which finds all m-colorings of a graph. [8M]

(OR)

8. a) State the concept of branch and bound method and also list its applications. [8M]
   b) Solve the Travelling Salesman problem using branch and bound algorithms. [7M]

UNIT-V

9. a) With a neat diagram, explain the relevance of NP-hard and NP-complete problems. [8M]
   b) Write about the theory of NP-Completeness. [7M]

(OR)

10. a) What are tries? Explain the algorithm for their formation. [8M]
    b) What are suffix trees? What are the applications of suffix trees? [7M]

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