Code No: R2031052 **R20** SET - 1

III B. Tech I Semester Regular Examinations, Dec/Jan – 2022-23
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE, IT)

Time: 3 hours Max. Marks: 70

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

1. a) Describe best case, average case and worst case efficiency of an algorithm. [7M]
   b) Write an algorithm for linear search and analyze the algorithm for its time complexity. [7M]

(OR)

2. a) Mention the important advantages and disadvantages of using randomized algorithms. [7M]
   b) Differentiate performance measurement and performance estimation of algorithms. [7M]

UNIT-II

3. a) Write and explain the control abstraction for Divide and Conquer approach. [7M]
   b) Trace the quick sort algorithm to sort the list C, O, L, L, E, G, E in alphabetical order. [7M]

(OR)

4. a) What is minimum spanning tree? Explain the Kruskal's algorithm to find the minimum spanning by taking an illustrative graph [7M]
   b) How many ways we can merge the files on optimal merge pattern? [7M]

UNIT-III

5. a) List the drawback of Divide and Conquer method, how can you address these in Dynamic Programming? [7M]
   b) Use the function OBST to compute w(i,j), r(i,j), and c(i,j), $0 \le i < j \le 4$, for the identifier set (a1, a2, a3, a4) = (do, if, int, while) with p(1 : 4) = (3, 3, 1, 1) and q(0:4)=(2,3,1,1,1). Using the r(i,j)'s construct the optimal binary search tree. [7M]

(OR)

6. a) Illustrate the working principle of Dynamic Programming with All Pairs Shortest Path problem. [7M]
   b) Write dynamic programming solution for the Traveling Sales Person problem for the network with the cost adjacency matrix below. Assume node 1 as the home city. [7M]

0	10	15	30
4	0	9	11
5	13	0	10
7	7	8	0

UNIT-IV

7. a) What is sum-of-subsets problem? Write a recursive backtracking algorithm for sum of subsets problem. [7M]
   b) Describe Backtracking technique to m-coloring graph. [7M]

(OR)

8. a) Briefly explain n-queen problem using backtracking. [7M]
   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]

UNIT-V

9. a) Explain the P, NP, NP-Hard and NP- complete classes with suitable examples. [7M]
   b) Briefly explain Cooks-theorem. [7M]

(OR)

10. a) Show that the Hamiltonian cycles problem on directed graphs is NP-complete. [7M]
    b) Write about non deterministic algorithms and choice, failure and success functions with search example. [7M]

Code No: R2031052 **R20** SET - 2

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

UNIT-I

1. a) Write an algorithm for Bubble sort and analyze the algorithm for its time complexity. [7M]
   b) What are the different mathematical notations used for algorithm analysis? Explain them [7M]

(OR)

2. a) Write short notes on probabilistic analysis. Discuss its role in Algorithemic analysis. [7M]
   b) Write Randomized algorithm of Quick sort. [7M]

UNIT-II

3. a) Using Merge sort, sort the following elements: [7M]
   310, 285, 179, 652, 351, 423, 861, 254, 450, 520
   b) Explain Defective chess board Problem. [7M]

(OR)

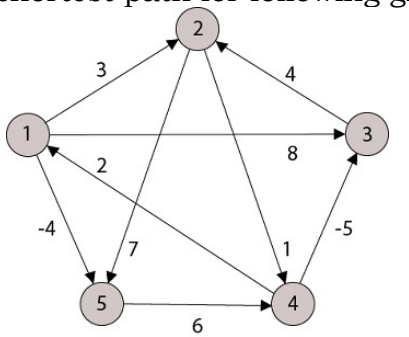
4. a) Apply the greedy method to solve Knapsack problem for given instance Where n=3, m=20, (p1,p2,p3)=(25,24,15), and weight (w1,w2,w3)=(18,15,10). [7M]
   b) What is the need of greedy method, explain with an example? [7M]

UNIT-III

5. a) Draw an Optimal Binary Search Tree for n=4 identifiers (a1,a2,a3,a4) = (do, if, read, while) P(1:4)=(3,3,1,1) and Q(0:4)=(2,3,1,1,1). [7M]
   b) Explain Multistage Graphs with example. [7M]

(OR)

6. a) Show that reliability design problem finds the best solution with multiple stages for the given instance. N=3, (c1,c2,c3)= (40,15,25), and C=120, (r1,r2,r3)= (0.9,0.8,0.7). [7M]
   b) Compute All pairs-shortest path for following graph. [7M]



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UNIT-IV

7. a) Explain the 4-queen problem using backtracking. [7M]
   b) Explain how the Euler circuit problem is solved by using the backtracking concept. [7M]

(OR)

8. a) Explain the major drawbacks of backtracking method with example. [7M]
   b) Write an algorithm for sum of subsets problem. [7M]

UNIT-V

9. a) Explain the classes of NP-Hard and NP-Complete. [7M]
   b) Discuss about deterministic and non-deterministic algorithms. [7M]

(OR)

10. a) Give examples of some deterministic algorithms. Justify. [7M]
    b) Using an example prove that, satisfiability of boolean formula in 3-Conjunctive Normal form is NP-Complete. [7M]

Code No: R2031052 **R20** SET - 3

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(Common to CSE, IT)

Time: 3 hours Max. Marks: 70

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

UNIT-I

1.	a)	Explain Amortized analysis with example.	[7M]
	b)	Compare Big-oh, Omega (Ω) and Little-oh notation. Illustrate with an example.	[7M]
		(OR)	
2.	a)	Write an algorithm for Binary search and analyze the algorithm for its time complexity	[7M]
	b)	Define Time Complexity. Describe different notations used to represent these complexities	[7M]

UNIT-II

3.	a)	Give the divide and conquer solution for Binary Search algorithm	[7M]
	b)	Explain the merge sort algorithm with an example. Design an algorithm for it.	[7M]
		(OR)	
4.	a)	Consider the following instance of Knapsack problem N=3, M=20, (p1,p2,p3)=(25,24,15), (w1,w2,w3)=(18,15,10) Calculate Maximum profit, Minimum weight and Maximum profit per unit weight	[7M]
	b)	What is Minimum cost spanning tree? Explain an algorithm for generating minimum cost Spanning tree and list some applications of it.	[7M]

UNIT-III

5.	a)	Write and explain an algorithm to compute the all pairs shortest path using dynamic programming and prove that it is optimal	[7M]
	b)	Solve the following 0/1 Knapsack problem using dynamic programming P= (11, 21, 31, 33), W= (2, 11, 22, 15), C=40, n=4.	[7M]
		(OR)	
6.	a)	Discuss the time and space complexity of Dynamic Programming Traveling Sales Person algorithm.	[7M]
	b)	Compare Dynamic programming with Greedy method.	[7M]

UNIT-IV

7.	a)	Give the solution to the 8-queens problem using backtracking	[7M]
	b)	Write the general procedure for back tracking algorithm.	[7M]
		(OR)	
8.	a)	Explain the Graph – coloring problem. And draw the state space tree for m= 3 colors n=4 vertices graph. Discuss the time and space complexity.	[7M]
	b)	Explain the major drawbacks of backtracking method with example. How can they be handled?	[7M]

UNIT-V

9. a) Explain the classes of NP and NP-Complete giving example problem for each. [7M]
   b) Give examples of some non-deterministic algorithms. Justify. [7M]

(OR)

10. a) Explain the strategy to prove that a problem is NP hard. [7M]
    b) Give the applications of Cook's theorem. [7M]

Code No: R2031052 **R20** SET - 4

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

UNIT-I

1. a) Explain time complexity of insertion sort in different cases. [7M]
   b) Explain the asymptotic notations with an example for each. [7M]

(OR)

2. a) How to measure the performance of an algorithm? Give some parameters. [7M]
   b) Analyze the computing time complexity of binary search algorithm. [7M]

UNIT-II

3. a) Compare and contrast the general method of greedy and divide and conquer approaches. [7M]
   b) Design an algorithm to sort the given list of elements using Quick Sort incorporating divide and conquer technique. Sort the following list using the same and compute its best case time efficiency: 4, 2, 0, 8, 7, 1, 3, 6. [7M]

(OR)

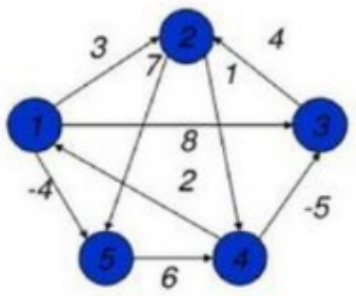
4. a) Explain the Knapsack problem. Find an optimal solution to the Knapsack instance n=7, m=15, (p1, p2, p3, …p7)=(10,5,15,7,6,18,3) and (w1, w2, w3, …w7)=(2, 3, 5,7, 1, 4, 1). [7M]
   b) Explain single source shortest path Problem with example. [7M]

UNIT-III

5. a) Solve the following 0/1 Knapsack problem using dynamic programming P= (11, 21, 31, 33), W= (2, 11, 22, 15), C=40, n=4. [7M]
   b) Explain the methodology of Dynamic programming. Mention the applications of Dynamic programming. [7M]

(OR)

6. a) Discuss the time and space complexity of Dynamic Programming traveling sales person algorithm. [7M]
   b) Compute All pairs-shortest path for following graph. [7M]



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UNIT-IV

7. a) Find a solution to the 8-Queens problem using backtracking strategy. Draw the solution space using necessary bounding function. [7M]
   b) Find all m-colors of a graph with undirected connections v1->2, v1->v3, v1->v4, v2->v3, v2->v4, v2->v5, v3->v4, v4->v5 using backtracking technique. [7M]

(OR)

8. a) Write the algorithm for general iterative backtracking method and explain various factors that define the efficiency of backtracking. [7M]
   b) Explain the Graph – coloring problem. And draw the state space tree for m= 2 colors n=4 vertices graph. Discuss the time and space complexity. [7M]

UNIT-V

9. a) Briefly explain NP-hard and NP-completeness with example. [7M]
   b) Explain non deterministic algorithms? Give some examples. [7M]

(OR)

10. a) Is Travelling salesman problem NP-hard or NP-Complete? Justify your answer. [7M]
    b) How many steps are required to prove that a decision problem is NP-Complete? Justify. [7M]