Code No: RT32054 **R13** SET - 1

III B. Tech II Semester Regular Examinations, April - 2016
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE and IT)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Distinguish between Algorithm and Psuedocode.	[3M]
	b)	Describe the Algorithm Analysis of Binary Search.	[4M]
	c)	State the Job – Sequencing Deadline Problem.	[4M]
	d)	Define i) Principles of optimality ii) Feasible solution iii) Optimal solution.	[3M]
	e)	Write the Control Abstraction of iterative Backtracking method.	[4M]
	f)	Distinguish between fixed – tuple sized and variable tuple sized state space tree organization.	[4M]

PART –B

2	a)	Explain the properties of an algorithm with an example.	[4M]
	b)	Give the algorithm for matrix multiplication and find the time complexity of the algorithm using step – count method.	[8M]
	c)	Differentiate between Bigoh and omega notation with example.	[4M]
3	a)	What is meant by Divide – and – Conquer approach?	[3M]
	b)	Write Divide – And – Conquer recursive Merge sort algorithm and derive the time complexity of this algorithm.	[8M]
	c)	Write the General method of Divide – And – Conquer approach.	[5M]
4	a)	State the Greedy Knapsack? Find an optimal solution to the Knapsack instance n=3, m=20, (P1, P2, P3) = (25, 24, 15) and (W1, W2, W3) = (18, 15, 10).	[8M]
	b)	What is a Spanning tree? Explain Prim's Minimum cost spanning tree algorithm with suitable example.	[8M]
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).	[9M]
	b)	Explain how Matrix – chain Multiplication problem can be solved using dynamic programming with suitable example.	[7M]
6	a)	What is a Hamiltonian Cycle? Explain how to find Hamiltonian path and cycle using backtracking algorithm.	[8M]
	b)	Discuss the 4 – queen's problem. Draw the portion of the state space tree for n = 4 queens using backtracking algorithm.	[8M]
7	a)	Give the 0/1 Knapsack LCBB algorithm. Explain how to find optimal solution using variable – tuple sized approach.	[9M]
	b)	Distinguish between backtracking and branch – and bound techniques.	[7M]

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PART –A

1	a)	Define i) Profiling ii) Time Complexity iii) Space Complexity.	[3M]
	b)	State the Greedy Knapsack Problem.	[4M]
	c)	Distinguish between Prim's and Kruskal's Spanning tree algorithm.	[4M]
	d)	Draw all possible binary search trees for the identifier set (do, if, stop).	[4M]
	e)	Define Chromatic number & Give the state space tree for 4 – coloring problem.	[4M]
	f)	Define Bounding Function? Give the statement of 0/1 Knapsack FIFO BB.	[3M]

PART –B

2	a)	What are the different mathematical notations used for algorithm analysis.	[4M]
	b)	Give the algorithm for transpose of a matrix m x n and determine the time complexity of the algorithm by frequency – count method.	[8M]
	c)	Discuss the Amortized analysis with an example.	[4M]
3	a)	What are the advantages and disadvantages of Divide – And – Conquer?	[3M]
	b)	Write Divide – And – Conquer recursive Quick sort algorithm and analyze the algorithm for average time complexity.	[8M]
	c)	Derive the time complexity of Quick sort algorithm for worst case.	[5M]
4	a)	State the Job – Sequencing with deadlines problem. Find an optimal sequence to the n=5 Jobs where profits (P1,P2,P3,P4,P5) = (20,15,10,5,1)and deadlines (d1,d2,d3,d4,d5) =(2,2,1,3,3).	[8M]
	b)	What is a Minimum Cost Spanning tree? Explain Kruskal's Minimum cost spanning tree algorithm with suitable example.	[8M]
5	a)	Explain Reliability Design Problem with suitable example.	[7M]
	b)	Describe the Dynamic 0/1 Knapsack Problem. Find an optimal solution for the dynamic programming 0/1 knapsack instance for n=3, m=6, profits are (p1, p2, p3) = (1,2,5), weights are (w1,w2,w3)=(2,3,4).	[9M]
6	a)	Write an algorithm for N – queen's problem. Give time and space complexity for 8 – queen's problem.	[8M]
	b)	Give the statement of sum –of subsets problem. Find all sum of subsets for n=4, (w1, w2, w3, w4) = (11, 13, 24, 7) and M=31.Draw the portion of the state space tree using fixed – tuple sized approach.	[8M]

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7 a) What is LC – Search? Discuss LC – Search algorithm. [7M]

b) Explain Travelling sales person person problem LCBB procedure with the following instance and draw the portion of the state space tree and find an optimal tour. [9M]

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

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Code No: RT32054 **R13** SET - 3

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PART –A

1	a)	Describe & Define any three Asymptotic Notations.	[3M]
	b)	Write Control Abstraction of Divide – and – Conquer.	[4M]
	c)	Find an optimal solution to the knapsack instance n=4 objects and the capacity of knapsack m=15, profits (10, 5, 7, 11) and weight are (3, 4, 3, 5).	[4M]
	d)	Distinguish between Dynamic Programming and Greedy method.	[4M]
	e)	What is a Backtracking and give the 4 – Queens's solution.	[4M]
	f)	Define : i) LC – Search ii) Branch and Bound (BB) iii) FIFO – BB.	[3M]

PART –B

2	a)	Explain the performance Analysis.	[4M]
	b)	Give the algorithm for matrix additions and determine the time complexity of this algorithm by frequency – count method.	[8M]
	c)	Discuss the Pseudo code conventions for expressing algorithms.	[4M]
3	a)	Distinguish between Merge sort and quick sort.	[3M]
	b)	Explain Recursive Binary search algorithm with suitable examples.	[8M]
	c)	Discuss the time complexity of Binary search algorithm for best and worst case.	[5M]
4	a)	Find an optimal solution to the knapsack instance n=7 objects and the capacity of knapsack m=15. The profits and weights of the objects are (P1,P2,P3, P4, P5, P6, P7)= (10, 5,15,7,6,18,3) (W1,W2,W3,W4,W5,W6,W7)= (2,3,5,7,1,4,1)	[8M]
	b)	Discuss the single – source shortest paths algorithm with suitable example.	[8M]
5	a)	What is All – Pair Shortest Path problem (APSP)? Discuss the Floyd's APSP algorithm and discuss the analysis of this algorithm.	[9M]
	b)	What is principle's of optimality? Explain how travelling sales person problem uses the dynamic programming technique with example.	[7M]
6	a)	Write control abstraction for backtracking.	[7M]
	b)	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.	[9M]
7	a)	Write Control Abstraction of Least – Cost(LC) Search.	[7M]
	b)	Explain the FIFO BB 0/1 Knapsack problem procedure with the knapsack instance for n=4.m=15,(p1,p2,p3,p4)=(10,10,12,18) (w1,w2,w3,w4) =(2, 4, 6, 9). Draw the portion of the state space tree and find optimal solution.	[9M]

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Code No: RT32054 **R13** SET - 4

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Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1 a) Describe Different characteristics of an algorithm. [3M]

b) Distinguish between Divide and conquer and Greedy method. [4M]

c) Write Control Abstraction of Greedy method. [4M]

d) Give the statement of Reliability design problem. [4M]

e) Define : i) State Space tree ii) E – Node and iii) Dead Node. [3M]

f) Write the Control Abstraction of Least – Cost Branch and Bound. [4M]

PART –B

2 a) Explain recursive functions algorithm analysis with an example. [4M]

b) Explain the method of determining the complexity of procedure by the step count approach. Illustrate with an example. [8M]

c) Give the Big – O notation definition and briefly discuss with suitable example. [4M]

3 a) What is stable sorting method? Is Merge sort a stable sorting method? [3M]

b) Explain partition exchange sort algorithm and trace this algorithm for n =8 elements: 24,12, 35, 23,45,34,20,48 [8M]

c) Write non – recursive binary search algorithm? [5M]

4 a) Explain differences between Prim's and Kruskal's Minimum spanning Tree algorithm. Derive the time complexity of Kruskal's algorithm. [8M]

b) Discuss the Dijkstra's single source shortest path algorithm and derive the time complexity of this algorithm. [8M]

5 a) Construct an optimal travelling sales person tour using Dynamic Programming. [9M]

$$\begin{pmatrix} 0 & 10 & 9 & 3 \\ 5 & 0 & 6 & 2 \\ 9 & 6 & 0 & 7 \\ 7 & 3 & 5 & 0 \end{pmatrix}$$

b) Discuss the time and space complexity of Dynamic Programming traveling sales person algorithm. [7M]

6 a) What is a backtracking? Give the explicit and implicit constraints in 8 queen's problem. [8M]

b) Draw the portion of state space tree for 4 queen's problem using variable – tuple sized approach. [8M]

7 a) Draw the portion of state space tree generated by FIFOBB for the job sequencing with deadlines instance n=5 , (p1,p2,..,p5) =(6,3,4,8,5), (t1,t2,..t5) = (2,1,2,1,1) and (d1,d2,..,d5)=(3,1,4,2,4).What is the penalty corresponding to an optimal solution. [8M]

b) Draw the portion of state space tree generated by LCBB for the 0/1 Knapsack instance: n = 5, (p1,p2,…,p5) = (10,15,6,8,4), (w1,w2,..,w5) = (4,6,3,4,2) and m=12. Find an optimal solution using fixed – tuple sized approach. [8M]

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