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

III B. Tech II Semester Supplementary Examinations, November/December - 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)	What are the characteristics of an algorithm?	[3M]
	b)	Define Divide & Conquer Strategy.	[3M]
	c)	Explain about single source shortest path problem.	[4M]
	d)	Differentiate between greedy method and dynamic programming.	[4M]
	e)	Define graph coloring	[4M]
	f)	Explain about Branch and Bound method.	[4M]

PART –B

2	a)	Compare time complexity with space complexity?	[8M]
	b)	Write the pseudo code for expressing algorithms.	[8M]
3	a)	Write and explain recursive binary search algorithm.	[8M]
	b)	Derive the time complexity of merge sort.	[8M]
4	a)	Write with an example of Prim's algorithm.	[8M]
	b)	Write a greedy algorithm for sequencing unit time jobs with dead lines and profits.	[8M]
5	a)	Explain Optimal Binary Search tree.	[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.	[8M]
6	a)	Discuss Sum of subset problem.	[8M]
	b)	Discuss about n-queen problem.	[8M]
7	a)	Explain FIFO Branch and Bound solution.	[8M]
	b)	Explain 0/1 Knapsack problem with respect to branch and bound method.	[8M]

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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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Code No: RT32054 **R13** SET - 2

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)	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]

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

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)	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

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) 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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Code No: **R32053** **R10** **Set No. 1**

III B.Tech II Semester Supplementary Examinations, Dec - 2015
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE and IT)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1 a) Define and explain the terms "Time complexity" and "Space complexity" of algorithms.
b) Explain about Amortized Analysis.

2 What are Sets? How are they represented? Explain various operations on Disjoint Sets.

3 a) Write and explain the control abstraction for Divide and Conquer.
b) Briefly explain Merge Sort Algorithm with suitable example and Derive its Time Complexity.

4 a) Define Greedy Method. Explain about Knapsack Problem with an example.
b) 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.

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.
b) Consider three stages of a system with r1=0.3, r2=0.5, r3=0.2 and c1=30, c2=20, c3=30 Where the total cost of the system is C=80 and u1=2, u2=3, u3=2 find the reliability design.

6 a) Briefly explain n-queen problem using Backtracking. Explain its applications.
b) Briefly explain Hamiltonian cycles using backtracking.

7 a) Define the terms Branch and Bound. Explain about its general method.
b) Solve 0/1 knapsack problem using Branch and Bound.

8 Explain the principles of:
(a) Control Abstraction for LC-search, (b) Bounding and (c) FIFO Branch & Bound.

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Code No: R32053 **R10** **Set No: 1**

III B.Tech. II Semester Regular/Supplementary Examinations, May/June -2014

DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science & Engineering and Information Technology)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. Explain in brief about Asymptotic Notations with examples

2. (a) What is an Articulation Point? Write the Algorithm to find Articulation points
   (b) The pre-order and post-order sequences of a binary tree do not uniquely define binary tree. Justify your answer.

3. If matrices A= $\begin{bmatrix} 5 & 3 & 0 & 2 \\ 4 & 3 & 2 & 6 \\ 7 & 8 & 1 & 4 \\ 9 & 4 & 6 & 7 \end{bmatrix}$ B= $\begin{bmatrix} 3 & 2 & 4 & 7 \\ 2 & 5 & 2 & 9 \\ 3 & 9 & 0 & 3 \\ 7 & 6 & 2 & 1 \end{bmatrix}$

   Implement Strassen's matrix multiplication on A and B

4. (a) Write an algorithm of prim's minimum spanning tree.
   (b) Find the optimal solution of the Knapsack instance n= 7, M=15, (p1,p2,….p7) = (10,5,15,7,6,18,3) and (w1,w2,…..w7)=(2,3,5,7,1,4,1)

5. (a) Define merging and purging rules in o/1 Knapsack problem.
   (b) Write an algorithm for all pairs shortest path. Explain with an example

6. What is Graph coloring? Write an algorithm for it and explain with an example.

7. What is bounding? Explain the following with an example.
   (a) Job Sequencing with Deadlines
   (b) FIFO Branch and Bound
   (c) LC Branch and Bound

8. (a) Prove that Chromatic Number decision problem is NP-Complete.
   (b) Write notes on NP-hard graph problems.

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Code No: R32053 **R10** **Set No: 2**

III B.Tech. II Semester Regular/Supplementary Examinations, May/June -2014

DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science & Engineering and Information Technology)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Explain about Amortized analysis
   (b) Prove $3n^3 + 2n^2 = O(n)^3$; 3^n !=$O(2^n)$

2. (a) Write a non-recursive algorithm of in-order traversal of a tree and also analyze its space and time complexity.
   (b) How data representation of sets is performed? Write about connected components.

3. Show how the Quick sorts the following sequences of keys in ascending order
   22, 55, 33, 11, 99, 77, 55, 66, 54, 21, 32

4. (a) Write a pseudo code of a simpler version of Dijkstra's algorithm that finds only the distances from a given vertex to all other vertices of a graph represented by its weight matrix.
   (b) Write the procedure for GREEDY KNAPSACK (P, W, M, X, N) where P and W contains profits and weights, M is Knapsack size and X is the solution vector.

5. Consider 4 elements $a_1 < a_2 < a_3 < a_4$ with $q_0=0.25$, $q_1=3/16$, $q_2=q_3=q_4=1/16$. $p_1=1/4$, $p_2=1/8$ $p_3=p_4=1/16$.
   (a) Construct the optimal binary search tree as a minimal cost tree.
   (b) Construct the table of values W_{ij}, C_{ij}, V_{ij} computed by the algorithm to compute the roots of optimal subtrees

6. (a) There are 5 distinct numbers {1, 2, 3, 4, 5}. Find the combinations of these numbers such that the sum is 9. Use the backtracking model to arrive at the solution.
   (b) Discuss about (i) State space tree (ii) Graph coloring

7. (a) Draw the portion of state space tree generated by LCKNAP for the Knapsack instances : n=5,
   $(P_1,P_2,\ldots..P_5) = (10, 15, 6, 8, 4)$, $(W_1,W_2,\ldots.W_5) = (4, 6, 3, 4, 2)$ and M = 12.
   (b) Write about Row Minimization in TSP

8. (a) Write the properties of NP-Complete and NP-Hard Problems
   (b) State Cook's theorem and explain its importance.

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Code No: R32053 **R10** **Set No: 3**

III B.Tech. II Semester Regular/Supplementary Examinations, May/June -2014

DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science & Engineering and Information Technology)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Define time and space complexity. Describe different notations used to represent these complexities.
   (b) Describe about Order of Growth with time function.
2. Explain the set representing using tree and develop algorithms for UNION and FIND using weighing and collapsing rules.
3. (a) Solve the recurrence relation of formula $T(n) = \begin{cases} g(n) & n \text{ is small} \\ 2T(n/2) + F(n) & otherwise \end{cases}$

   When (i) g(n) = O(1) and f(n)= O(n)
   (ii) g(n)= O(n) and f(n)=O(1)

   (b) Write and explain Divide and conquer algorithm for computing the no of levels in a binary tree.

4. (a) What do you mean by minimum spanning tree? write and explain algorithm for minimal spanning tree with an example.
   (b) Differentiate between Divide and Conquer algorithm & greedy Algorithm

5. (a) Solve the all-pair shortest path problem for given adjacency matrix graph using Floyd's algorithm

$$\begin{bmatrix} 0 & 2 & \infty & 1 & 8 \\ 6 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & \infty \end{bmatrix}$$

   (b) Distinguish the following: (i) Dynamic Programming vs. Divide and Conquer
   (ii) Dynamic Programming vs. Greedy method

6. Write an algorithm for how Eight Queen's problem can be solved using back tracking and explain with an example

7. (a) Write a Program schema for a LIFO branch and bound search for Least-cost answer node.
   (b) Write a short note on LC search

8. (a) How to deal with a NP-Complete problem? Discuss with example
   (b) Write the properties of NP-Complete and NP-Hard Problems.

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Code No: R32053 **R10** **Set No: 4**

III B.Tech. II Semester Regular/Supplementary Examinations, May/June -2014

DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science & Engineering and Information Technology)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) How the performance can be analyzed ? Explain with the example.
   (b) What is Randomizer? Give Cons and Pros

2. For the following sequence of instructions

   UNION (1, 2, 2)
   UNION (2, 3, 3)
   :
   :
   UNION (n-1, n, n)
   FIND (1)
   FIND (2)
   :
   FIND (n)

   (a) Write the tree after (n-1) UNION operations.
   (b) Compute the cost of n FIND instructions

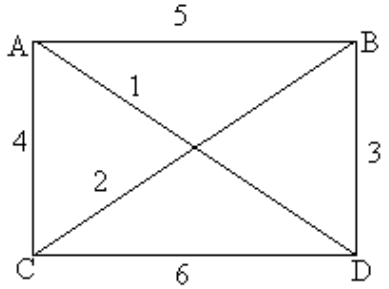
3. Apply quick sort to sort the list.

   E, X, A, M, P, L, E

   In alphabetical order . Draw the tree of recursive calls made.

4. (a) If objects are selected in order of increasing vi/wi then prove that the algorithm knapsack finds an optimal solution.
   (b) Write an algorithm for Single source shortest path. Explain with an example

5. (a) Find the shortest tour of TSP for the following graph using dynamic programming



   (b) What is the best method between greedy method and dynamic programming to solve single source shortest path problem? Justify your answer with example.

6. (a) Consider a set S= {5, 10, 12, 13, 15, 18} and d= 30. Solve it for obtaining sum of subset
   (b) What is Hamiltonian Cycle? Describe with an example

7. (a) Describe Travelling Salesperson Problem(TSP) with an example.
   (b) Explain the following with an example (i) Full Reduction (ii) Dynamic Reduction

8. (a) State and prove Cook's Theorem
   (b) Discuss about the complexity of NP-Hard problems.

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