Code: 9A05403

1

B.Tech II Year II Semester (R09) Regular & Supplementary Examinations, April/May 2013

DESIGN AND ANALYSIS OF ALGORITHMS

(Common to CSS, IT and CSE)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Give brief description about performance measurement.

(b) Write an algorithm to implement magic square.

2 (a) Define collapsing rule. Write the algorithm for COLLAPSING FIND by using COLLAPSING RULE.

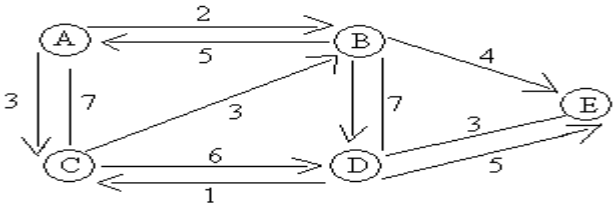
(b) Draw the different trees for the following sets $S_1 = \{1, 7, 8, 9\}$, $S_2 = \{2, 5, 10\}$, $S_3 = \{3, 4, 6\}$ with root nodes as 1, 5 and 3.

3 (a) Draw the tree calls of the function merge for the following set of elements:
(5, 80, 30, 20, 50, 10, 70, 60, 40, 90).

(b) Sort the above set of elements by using merge sort.

4 With the help of a suitable example, explain the greedy knapsack.

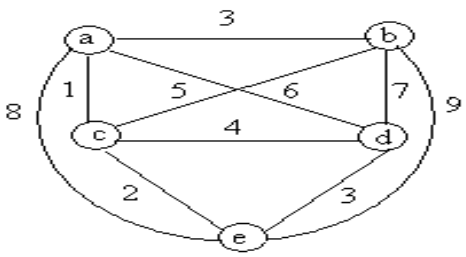
5 Find the shortest path b/w all pairs of nodes in the following graph.



6 (a) Explain how the solution to the backtracking problems is represented. And how it is built.

(b) Give the explicit and implicit constraints in 8-queens problem.

7 Solve the traveling sales man problem for the following graph by using branch and bound.



8 Explain about decision and optimization problems with an examples.

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1 (a) Explain the different areas of research where the algorithms can be applied.
(b) Explain how to identify the repeated elements.

2 (a) Explain the scheme to construct bi-connected graph.
(b) What is articulation point? Explain with example.

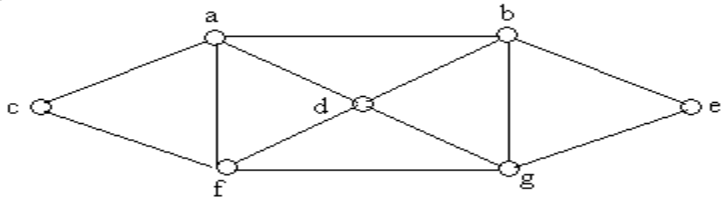
3 (a) Write an algorithm to sort N numbers in ascending order using merge sort.
(b) Compute the time complexity for merge sort.

4 (a) Present a greedy algorithm for sequencing unit time jobs with deadlines and profits.
(b) Present an optimal randomized algorithm for minimum cost spanning trees.

5 Find the optimal sequence by using traveling sales person for the following given instance.

	A	B	C	D
A	α	12	5	7
B	11	α	13	6
C	4	9	α	18
D	10	3	2	α

6 (a) Apply backtracking to the problem of finding a Hamiltonian circuit in following graph.



(b) Write the implementation of the above algorithm.

7 (a) Write FIFOBB algorithm for the 0/1 knapsack problem.
(b) Explain the general method of branch and bound.

8 (a) Prove that if $X \in NP$ y is NP-hard, then $X \leq_T^P Y$. In other words, NP-hard problems are at least as hard as any problems in NP.
(b) Prove that any two NP-complete problems are polynomially turning equivalent.

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1 (a) Write Miller-Rabin's primality testing algorithm.

(b) Discuss the different approaches to find the time complexity of algorithm.

2 (a) Give the trees for the set {1, 2, 3, 4, 5, … n} by using weighting rule.

(b) Give an algorithm for implementation of union instruction using linked list and explain its implementation.

3 (a) Derive the time complexity for strassen's matrix multiplication.

(b) How many additions, multiplications and subtractions are needed for a 2 x 2 matrix multiplication?

4 (a) Write a detailed note on job sequencing with deadlines.

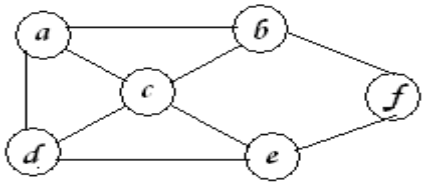
(b) Explain in detail about the optimal randomized algorithm for minimum cost spanning trees.

5 (a) How would you construct an optimal binary search tree for a set of n keys if all the keys are equally likely to be searched for? What will be the average number of comparisons in the tree if $n = 2^k$?

(b) Write a pseudo code of the bottom-up dynamic programming algorithm for the knapsack problem.

6 (a) Generate all permutations of {1, 2, 3, 4} by backtracking.

(b) Apply backtracking to solve the 3-coloring problem for the graph of.



7 (a) Explain how the traveling salesperson problem is solved by using LC branch and bound.

(b) Write the general algorithm for branch and bound.

8 Give a dynamic programming solution for the subset sum problem. Analyze the asymptotic order of your solution. Explain why this solution does not put the subset sum problem in NP-hard.

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4

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DESIGN AND ANALYSIS OF ALGORITHMS

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Time: 3 hours Max Marks: 70

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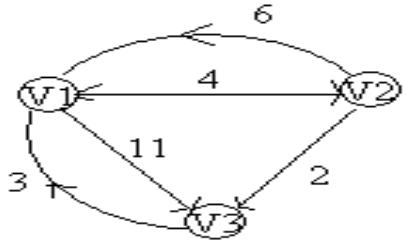
1 (a) Define an algorithm. Explain the different criteria that satisfy the algorithm.
(b) Briefly explain about asymptotic notations.

2 Explain spanning trees and minimum cost spanning trees with suitable examples.

3 (a) What are the advantages of Strassens' matrix multiplication over normal one?
(b) Present an algorithm for quick sort by using iterative method.

4 (a) Present a general method of greedy technique.
(b) Explain the greedy knap sack with suitable example.

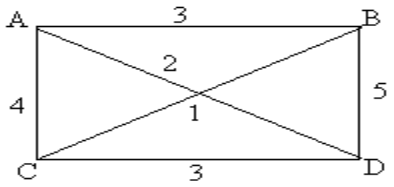
5 (a) Solve the following instance of the ALL PAIRS shortest path problem.



(b) Discuss how to compute the cost of binary search tree.

6 Draw and explain the tree organization of the 4-queen solution space.

7 Solve the TSP problem for the following graph using branch and bound technique.



8 Consider the problem DNF-DISSAT which takes a Boolean formula S in disjunctive normal form (DNF) as input and asks if S is dissatisfiable that is variable of S so that if evaluates to 0. Show that DNF-DISSAT is Np- complete.

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