Code No: RR210504 **Set No. 1**

II B.Tech I Semester Regular Examinations, November 2005
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to Computer Science & Engineering, Information Technology and Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Devise a Divide and Conquer algorithm to evaluate the polynomial at a point. Analyze carefully the time for your algorithm. [16]

2. (a) Compute 2101 * 1130 by applying Divide and Conquer method.
   (b) Applying Divide and Conquer strategy, write a recursive algorithm for finding the maximum and the minimum element from a list. [8+8]

3. (a) Applying the Greedy strategy, find the solution for optimal storage on tapes for the problem instance n=3, $(l_1, l_2, l_3) = (5,10,3)$.
   (b) Explain the 0/1 knapsack problem algorithm with the Greedy method. Show that this strategy doesn't necessarily yield optimal solution. [6+10]

4. (a) Write an algorithm for checking whether an array H [1,2,.....,n] is a heap or not.
   (b) Determine the time efficiency of the above algorithm. [8+8]

5. (a) Find an OBST for $a, b, ..., h$ if the elements in order have the probabilities $\{0.1, 0.2, 0.05, 0.1, 0.3, 0.05, 0.15, 0.05\}$ and all the other elements have zero probability.
   (b) Write the algorithm for OBST. [8+8]

6. (a) Explain the reachability problem in graphs.
   (b) Compute the time and space complexities of BFS algorithm on any graph G with n vertices and e edges, if the graph is represented by
      i. Adjacency list and
      ii. Adjacency matrix
   (c) Convert the given infix expression to postfix expression.
   (A+B+C) ↑ ((A+B) * C). [4+8+4]

7. (a) Explain the nim game.
   (b) Generate the complete game tree for nim with n=6. [8+8]

8. (a) Explain the solution to the Traveling sales person problem using LCBB.
   (b) Is the above technique applicable for a non-symmetric distance matrix? Substantiate. [8+8]

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Code No: RR210504 **Set No. 2**

II B.Tech I Semester Regular Examinations, November 2005
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to Computer Science & Engineering, Information Technology and Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Write a recursive algorithm for Towers of Hanoi. Trace the algorithm for 6 disks. Derive its time and space complexity. [16]

2. (a) Trace the Quick sort algorithm to sort the list C, O, L, L, E, G, E in alphabetical order.
   (b) Give an instance, where the Quick sort algorithm has worst case time complexity. [12+4]

3. Explain the algorithm for Job sequencing with deadlines. Applying the same, find the solution for the instance n = 4, $(p_1.....p_4)$=(100,10,15,27) and $(d_1.....d_4)$=(2,1,2,1).

   [16]

4. (a) What are Dictionaries? Explain.
   (b) What is a balanced tree? Differentiate between 2-3 trees and AVL trees.[6+10]

5. (a) What does Dynamic programming approach have common with Divide & Conquer method?
   (b) What is the principal difference between the two techniques?
   (c) Discuss briefly the solution to the traveling salesperson problem using dynamic programming. Can it be solved by using Divide & Conquer method? [6+4+6]

6. Write an algorithm to search a binary search tree T for an identifier X. Assume that each node in T has 3 fields: LCHILD, DATA, and RCHILD. What is the computing time of your algorithm? **[16]**

7. Define the following terms: state space, explicit constraints, implicit constraints, problem state, solution states, answer states, live nod, E-node, dead node, bounding functions. [16]

8. Consider the LCBB traveling salesperson algorithm described using the dynamic state space tree formulation. Let A and B be nodes. Let B be the child of A. If the edge (A, B) represents the inclusion of edge <i, j> in the tour, then in the reduced matrix for B all entries in row i and column j are set to ∞. In addition, one more entry is set to ∞. Obtain an efficient way to determine this entry. [16]

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Code No: RR210504 **Set No. 3**

II B.Tech I Semester Regular Examinations, November 2005
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to Computer Science & Engineering, Information Technology and Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Write an algorithm to evaluate a polynomial using Horner's rule.
   (b) Present an algorithm that searches for the element x in unsorted array a[1:n]. If x occurs, then return a position in the array; else return zero. Evaluate its time complexity. [8+8]
2. (a) Trace the Quick sort algorithm to sort the list C, O, L, L, E, G, E in alphabetical order.
   (b) Give an instance, where the Quick sort algorithm has worst case time complexity. [12+4]
3. (a) Prove that Kruskal's algorithm generates a minimum cost spanning tree for every connected undirected graph G.
   (b) Write the algorithm for optimal storage on tapes. [16]
4. (a) Write an algorithm for insertion and deletion in Binary search tree.
   (b) Write an algorithm for finding the height of the binary tree. [10+6]
5. (a) What do you mean by forward and backward approach of problem solving in Dynamic programming?
   (b) What are the differences between the Greedy and Dynamic programming methods of problem solving? [8+8]
6. (a) Explain the reachability problem in graphs.
   (b) Compute the time and space complexities of BFS algorithm on any graph G with n vertices and e edges, if the graph is represented by
      i. Adjacency list and
      ii. Adjacency matrix
   (c) Convert the given infix expression to postfix expression.
   (A+B+C) ↑ ((A+B) * C). [4+8+4]
7. Discuss the relevance of Backtracking technique to m-coloring graph. Explain with an example. [16]

8. Consider the traveling salesperson instance defined by the cost matrix.

$$\begin{bmatrix} \infty & 7 & 3 & 12 & 8 \\ 3 & \infty & 6 & 14 & 9 \\ 5 & 8 & \infty & 16 & 18 \\ 9 & 3 & 5 & \infty & 11 \\ 18 & 14 & 9 & 8 & \infty \end{bmatrix}$$

(a) Obtain the reduced cost matrix.

(b) Using a state space tree formulation and cost function $\hat{c}$, obtain theportion of the state space tree that will be generated by LCBB. Labeleach node by its ? value. Write out the reduced matrices corresponding to each of these nodes.

[8+8]

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Code No: RR210504 **Set No. 4**

II B.Tech I Semester Regular Examinations, November 2005
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to Computer Science & Engineering, Information Technology and Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. A polynomial of degree n>0 has n derivatives, each one obtained by taking the derivative of the previous one. Devise an algorithm which produces the values of a polynomial and its n derivatives. [8]

2. (a) Trace the Quick sort algorithm to sort the list C, O, L, L, E, G, E in alphabetical order.
   (b) Give an instance, where the Quick sort algorithm has worst case time complexity. [12+4]

3. (a) Show that in a complete graph with n vertices, the number of spanning trees generated can not be greater than (2^{n-1} -2).
   (b) Prove that any weighted connected graph with distinct weights has exactly one minimal spanning tree. [9+7]

4. (a) Construct a 2-3 tree for the list E, X, A, M, I, N, A, T, I, O, N.
   (b) Construct the neap tree for the list E, X, A, M, I, N, A, T, I, O, N. [8+8]

5. (a) Apply Dynamic programming technique for finding an optimal order of multiplying n matrices.
   (b) The root of OBST always contains the key with highest search probability. Discuss the validity of the above statement. [8+8]

6. Write a recursive and iterative algorithm to find the
   (a) number of nodes in a binary tree.
   (b) sum of contents of all nodes in a binary tree. [8+8]

7. (a) What is graph coloring? Present an algorithm which finds m-coloring of a graph.
   (b) Explain the recursive Backtracking algorithm. [8+8]

8. (a) Give the algorithm for FIFOBB for Knapsack problem.
   (b) Write a Backtracking algorithm using the static tree formulation. [8+8]

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