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

II B.Tech. I Semester Supplementary Examinations, May -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

⋆ ⋆ ⋆ ⋆ ⋆

1. Write the non-recursive algorithm for finding the Fibonacci sequence and derive its time complexity.

2. (a) Give the relative merits and demerits of Divide and Conquer when compared to the Greedy method.
   (b) Give the time complexity of the generic Divide and Conquer algorithm.

3. Explain the Kruskal's algorithm with an example and analyze its time complexity.

4. Write an algorithm to split the AVL tree and to concatenate two AVL trees. The algorithm should work in time proportional to the height of the tree.

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.

6. Write a non-recursive algorithm for the inorder traversal of binary tree T. Each node has 4 fields: LCHILD, DATA, PARENT, RCHILD. Your algorithm should take O(1) space and O(n) time for an n-node tree.

7. (a) Write a Backtracking algorithm for solving the Knapsack optimization problem using the variable tuple size formulation.
   (b) Obtain a Knapsack instance for which nodes are generated by Backtracking algorithm using a static tree than using a dynamic tree.

8. Draw the portion of a state space tree generated by FIFOBB, LCBB and LIFOBB for the job sequencing with deadlines instance n=5, $(p_1, p_2, ., p_5)$=(6,3,4,8,5), $(t_1, t_2, .., t_5)$=(2,1,2,1,1) and, $(d_1, d_2, .., d_5)$=(3,1,4,2,4). What is the penalty corresponding to an optimal solution? Use a variable tuple size formulation and $\hat{c}$ (.) and u (.)

⋆ ⋆ ⋆ ⋆ ⋆

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

II B.Tech. I Semester Supplementary Examinations, May -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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) What do you mean by performance analysis of an algorithm? Explain.
   (b) What do you mean by the input size of a problem? Explain its significance.
2. (a) Show that the procedure SEARCH of the Binary Search algorithm gives the smallest expected search time if all the elements in the set are sorted.
   (b) Write the non-recursive Binary search algorithm.
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).
4. Given 3 sets $\{1, 3, 5, 7\}, \{2, 4, 8\}$ and $\{6\}$ in which n=8 with external names 1, 2 and 3 respectively with the corresponding internal names 2, 3, and 1.
   (a) Write the data structures for UNION-FIND algorithm using a linked list
   (b) Write the data structures after UNION instruction.
5. Consider 4 elements $a_1 < a_2 < a_3 < a_4$ with q(0)=1/8, 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. Construct the table of values of W (i, j), R (i, j) and C (i, j) computed by the algorithm to compute the roots of optimal subtrees.
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?
7. (a) Write the algorithm for the post-order evaluation of game tree.
   (b) Define the terms α & β-values, α - β pruning, deep α - β pruning, α and β -cutoff.
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.

⋆ ⋆ ⋆ ⋆ ⋆

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

II B.Tech. I Semester Supplementary Examinations, May -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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) What do you mean by performance analysis of an algorithm? Explain.
   (b) What do you mean by the input size of a problem? Explain its significance.
2. (a) The worst case time of procedure MERGESORT is O(nlogn). What is its time in the best case? Justify.
   (b) What is stable sorting method? Is Merge sort a stable sorting method?
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).
4. (a) While executing each UNION instruction, the root of the tree with fewer vertices (ties are broken arbitrarily) is made a son of the root of the larger, then no tree in the forest of trees will have the height greater than or equal to h unless it has at least 2^h vertices. Prove this lemma using induction.
   (b) Compute the order of the worst case, execution time for n UNION and n FIND instructions for the above case.
   (c) Sketch the forest of trees before the path compression and after the path compression.
5. Consider the Knapsack instance n=6, m=165, $(p_1, p_2, ..., p_6) = (w_1, w_2, ..., w_6)$ = (100,50,20,10,7,3). Generate the S^i sets containing the pair (p_i, w_i) and thus find the optimal solution.
6. (a) Write an algorithm that uses BFS traversal to determine if undirected and directed graphs are cyclic?
   (b) Show that the time complexity of the above algorithm is of the order of n.
7. (a) Give the explicit and implicit constraints in 8 queen's problem.
   (b) Suggest a solution for 8 queen's problem.
8. (a) What is the data structure used to keep track of live nodes in the best first of Branch and Bound? Why?
   (b) Write the algorithm for LC search least cost answer node.

⋆ ⋆ ⋆ ⋆ ⋆

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

II B.Tech. I Semester Supplementary Examinations, May -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

⋆ ⋆ ⋆ ⋆ ⋆

1. Define time complexity. Describe different notations used to represent these complexities. Illustrate with suitable examples.
2. (a) Modify the Binary search of the text so that in the case of unsuccessful search it returns the index i such that k(i) <key < k(i+1).
   (b) Is Quick sort a stable sorting method? Justify your answer.
3. Explain the Kruskal's algorithm with an example and analyze its time complexity.
4. Show that an AVL tree of height h has atmost 2^{h+1}-1 vertices and atleast $((5+2\sqrt{5})/5 \quad ((1+2\sqrt{5})/2)^{h} \quad + \quad (5-2\sqrt{5})/5 \quad ((1-\sqrt{5})/2)^{h}-1)$ vertices.
5. (a) What is reliability? What is its importance and significance?
   (b) Using the Dynamic programming concept, give the solution to the reliability problem.
6. (a) Write an algorithm that uses BFS traversal to determine if undirected and directed graphs are cyclic?
   (b) Show that the time complexity of the above algorithm is of the order of n.
7. Compare and contrast
   (a) Bruteforce approach Vs Backtracking
   (b) fixed Vs variable tuple size formulation
8. Present a program schema for a FIFO Branch & Bound search for a Least-Cost answer node.

⋆ ⋆ ⋆ ⋆ ⋆