Code No: R09220505 | R09 | SET-1

B.Tech II Year - II Semester Examinations, April-May, 2012
DESIGN AND ANALYSIS OF ALGORITHMS
(COMMON TO COMPUTER SCIENCE AND ENGINEERING, INFORMATION TECHNOLOGY)

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

Answer any five questions
All questions carry equal marks
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1.a) Compare Big-oh notation and Little-oh notation. Illustrate with an example.
b) Find Big-oh notation and Little-oh notation for $f(n) = 7n^3 + 50n^2 + 200$. [15]

2. Explain the usefulness of the following fundamental operations on sets:
i) FIND ii) DELETE
iii) UNION iv) INSERT. [15]

3. Compute the product of the following matrices of 4 × 4 size, using Strassen's matrix multiplication method. [15]

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

4.a) Write the control abstraction for the Greedy method.
b) Compare Kruskhal's and Prim's algorithm. Give their time complexities. [15]

5. Consider n=4 and (q_1, q_2, q_3, q_4) = (do, if, int, while) the values for P's and q's are given as P(1:4) = (3, 3, 1, 1) and q(0:4) = (2, 3, 1, 1, 1). Construct the optimal binary search tree. [15]

6.a) Compare and contrast between fixed and variable tuple size formulation and illustrate it for the following sum of subset problem given below.
b) Let w = {7; 4; 10; 23; 35; 20; 32} and m=55. Find all possible subsets of w that sum to m. Draw the portion of the state space tree that is generated. [15]

7. Differentiate between Backtracking and Branch & Bound technique by considering 4- queen problem. Explain how nodes are generated and numbered in state space tree in the above two techniques. [15]

8.a) Write short notes on Cook's theorem.
b) Explain about different types of NP problem. [15]

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Code No: R09220505 | R09 | SET-2

B.Tech II Year - II Semester Examinations, April-May, 2012
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to Computer Science and Engineering, Information Technology)

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

Answer any five questions
All questions carry equal marks

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1. Write an algorithm in pseudo code to count the number of Lower case letters in a file of text. How many comparisons does it do? What is least number of increments it might do? Assume that N is number of characters in a file. Determine its time complexity using step count method? [15]

2.a) Explain the Disjoint set operations using trees?
b) Write Find and Union algorithms? [15]

3.a) Show how Merge sort sorts the following sequences of keys in ascending order. 12, 22, 33, 44, 48, 56, 57, 65, 76, 84 with a neat diagram representing sequence of recursion calls?
b) Discuss the time complexity of Merge sort? [15]

4.a) Explain the 0/1 Knapsack problem.
b) Find an optimal solution to the Knapsack instance n=7, m=15, and $(P_1,P_2,...P_7)$= (10,5,15,7,6,18,3) and $(W_1,W_2,...W_7)$= (2,3,5,7,1,4,1). [15]

5.a) What do you mean by forward and backward approach of problem solving in Dynamic programming?
b) Define merging and purging rules in 0/1 Knapsack problem. [15]

6.a) Describe the Backtracking technique to m-coloring graph. Explain with an example.
b) Draw the portion of the state space tree for m-colorings of a graph. [15]

7.a) Draw the portion of the state space tree generated by FIFOBB using the variable tuple size for the knapsack instances: n = 5; (P1; P2; ; P5) = (10; 15; 6; 8; 4); (w1;w2; ;;;w5) = (4; 6; 3; 4; 2) and M = 12.
b) Write the control abstraction of LC search. [15]

8. Explain the P, NP, NP-Hard and NP- complete classes? Give relationship between them? [15]

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Code No: R09220505 | R09 | SET-3

B.Tech II Year - II Semester Examinations, April-May, 2012
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to Computer Science and Engineering, Information Technology)

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

Answer any five questions
All questions carry equal marks

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1. Solve the recurrence relation of formula

$T(n) = g(n)$ n is small

$T(n) = 2T(n/2) + f(n)$, otherwise

when

i) $g(n) = O(1)$ and $f(n) = O(n)$;

ii) $g(n) = O(1)$ and $f(n) = O(1)$. [15]

2. Two sets S1 and S2 are given as below

S1={1,2,4,6} and S2 ={7,8}

a) Draw disjoint sets S1 and S2 using Trees

b) Draw disjoint sets S3 using Trees such that S3=S1 U S2

c) Draw disjoint sets S4 using Trees such that S4=S2 U S1

d) Give Pointer representation of S1, S2, S3 and S4. [15]

3.a) Discuss Control abstraction for divide and conquer strategy.

b) By applying Divide and Conquer strategy, write a recursive algorithm for finding the maximum and the minimum element from a list. [15]

4.a) Find the feasible solution for job sequencing with deadlines for the instance n=5, (P1,…,P5)=(20, 15, 10, 5, 1) and (d1,…,d5)= (2,2,1,3,3).

b) Explain the 0/1 knapsack problem algorithm with Greedy concept. [15]

5. Design a three stage system with device types D1, D2, D3. The costs are Rs.30, Rs.15 and Rs.20 respectively. The cost of the system is to be not more than Rs.105. The reliability of each device type is 0.9, 0.8 and 0.5 respectively. [15]

6.a) Explain the 4-Queen problem using backtracking?

b) Draw the permutation tree by taking implicit constraint, explicit constraint and bounding functions? [15]

7. Consider the Travelling salesperson instance defined by the cost matrix.

$$\begin{bmatrix} \infty & 11 & 10 & 9 & 6 \\ 8 & \infty & 7 & 3 & 4 \\ 8 & 4 & \infty & 4 & 8 \\ 11 & 10 & 5 & \infty & 5 \\ 6 & 9 & 5 & 5 & \infty \end{bmatrix}$$

a) Obtain the reduced cost matrix

b) Using a state space tree formulation, obtain the portion of the state space tree that will be generated by LCBB. Label each node by its c^ value. Write the reduced matrices corresponding to each of these nodes. [15]

8.a) Briefly explain the concepts of the NP-Hard and NP-Complete?

b) Explain non deterministic algorithms? Give some examples? [15]

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Code No: R09220505 | R09 | SET-4

B.Tech II Year - II Semester Examinations, April-May, 2012
DESIGN AND ANALYSIS OF ALGORITHMS
(Common to Computer Science and Engineering, Information Technology)

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

Answer any five questions
All questions carry equal marks

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1.a) Explain the performance analysis of an algorithm.
b) Write an algorithm for recursive binary search? [15]

2. Write and explain the final algorithm for collapse rule with an example. [15]

3.a) Show how quick sort sorts the following sequences of keys in ascending order. 12, 25, 35, 43, 48, 59, 77, 85, 86, 94?
b) Discuss the time complexity of the quick sort algorithm for the above case? [15]

4.a) Explain the control abstraction of Greedy method compare this with Dynamic programming.
b) WriteKruskals algorithm that generates minimum spanning tree for every connected undirected graph. [15]

5. The edge length of a directed graph are given by the below matrix. Using the Traveling salesperson algorithm, calculate the optimal tour. [15]

$$\begin{bmatrix} 0 & 20 & 30 & 10 & 11 \\ 15 & 0 & 16 & 4 & 2 \\ 3 & 5 & 0 & 2 & 4 \\ 19 & 6 & 18 & 0 & 3 \\ 16 & 4 & 7 & 16 & 0 \end{bmatrix}$$

6. Define the following terms: state space, explicit constraints, implicit constraints, problem state, solution states, answer states, live node, E-node, dead node, bounding functions. [15]

7.a) Describe the Traveling Salesperson Problem in Branch & Bound.
b) Explain the principles of FIFO & LC Branch & Bound? [15]

8. What are differences between NP-Hard and NP-Complete classes? Explain with examples. [15]

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