Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 90154

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth Semester

Computer Science and Engineering

CS8451 – DESIGN AND ANALYSIS OF ALGORITHMS

(Common to Computer and Communication Engineering / Information Technology)

(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. State the transpose symmetry property of O and Ω.

2. Define recursion.

3. State the convex hull problem.

4. Outline the knapsack problem.

5. What is Brute Force method ?

6. Define a binary search tree.

7. When a linear program is said to be unbounded ?

8. What is a residual network in the context of flow networks ?

9. When is a problem said to be NP hard ?

10. State the Hamiltonian circuit problem.

PART – B

(5×13=65 Marks)

11. a) i) Solve the following recurrence equations using iterative method or tree. (7)

    ii) Elaborate asymptotic analysis of an algorithm with an example. (6)

(OR)

b) Write an algorithm using recursion that determines the GCD of two numbers. Determine the time and space complexity.

12. a) State the travelling salesman problem. Elaborate the steps in solving the travelling salesman problem using brute force approach. **(13)**

(OR)

b) Write the algorithm to find the closest pair of points using divide and conquer and explain it with an example. Derive the worst case and average case time complexity. **(5+4+4)**

13. a) i) Outline the Dynamic programming approach to solve the Optimal Binary search tree problem and analyse its time complexity. **(4+2)**

ii) Construct the Optimal binary search tree for the following 5 keys with probabilities as indicated. **(7)**

i	0	1	2	3	4	5
p_i		0.15	0.10	0.05	0.10	0.20
q_i	0.05	0.10	0.05	0.05	0.05	0.10

(OR)

b) Write a Greedy algorithm to solve the 0/1 knapsack problem. Analyse its time complexity. Show that this algorithm is not optimal with an example. **(5+2+6)**

14. a) What is iterative improvement ? Elaborate the steps in the simplex method with an example. **(13)**

(OR)

b) i) What is a bipartite graph ? Is the subset of a bipartite graph bipartite ? Outline with an example. **(2+1+4)**

ii) Outline the stable Marriage problem with an example. **(6)**

15. a) Elaborate how backtracking technique can be used to solve the n-queens problem. Explain with an example. **(13)**

(OR)

b) Outline the steps to find an approximate solution to NP-hard optimization problems using approximation algorithms with an example. **(13)**

PART – C   **(1×15=15 Marks)**

16. a) Sort the following numbers using quick sort.

999, 888, 777, 666, 555, 444, 333, 222, 111, 11, 22, 33, 44, 55, 66, 77, 88, 99.

Illustrate each step in the sorting process. **(15)**

(OR)

b) i) The Longest Increasing Subsequence (LIS) problem is to find the length of the longest subsequence of a given sequence such that all elements of the subsequence are sorted in increasing order. Write an algorithm using dynamic programming that determines the LIS of a string 'x'. For example, the length of LIS for {10, 22, 9, 33, 21, 50, 41, 60, 80} is 6 and LIS is {10, 22, 33, 50, 60, 80}. **(10)**

ii) Determine the Time and Space complexity of the above algorithm. **(5)**