Reg. No. : | | | | | | | | | | |

Question Paper Code: 44204

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Fourth Semester

Computer Science and Engineering

14UCS404 - DESIGN AND ANALYSIS OF ALGORITHMS

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The main measure for efficiency algorithm are

   (a) Processor and Memory (b) Complexity and Capacity
   (c) Data and Space (d) Time and space

2. The time complexity of binary search is

   (a) O(1) (b) O(log n) (c) O(n) (d) O(n logn)

3. For the improvement of efficiency of quick sort the pivot can be

   (a) the first element (b) the mean element
   (c) the last element (d) None of these

4. Best case time complexity of Quick sort is

   (a) $O(n^2 \log n)$ (b) O(logn) (c) O(nlogn) (d) $O(\log n^2)$

5. The OBST algorithm in worst case takes _____ time if all c(i, j)'s and r(i, j)'s are calculated.

   (a) *O(log n)* (b) $O(n^4)$ (c) $O(n^3)$ (d) *O (n log n)*

6. Prim's algorithm is based on _____ method

   (a) Divide and conquer method (b) Greedy method
   (c) Dynamic programming (d) Branch and bound

7. A linear programming problem which does not have an optimal solution is called

(a) Unbounded (b) Infeasible
(c) Feasible (d) Non-optimal

8. A linear programming problem which does not have an optimal solution is called

(a) unbounded (b) infeasible
(c) feasible (d) non-optimal

9. A decision problem D is said to be NP-complete if

(a) It belongs to class NP (b) NP reduces to D
(c) only (a) (d) both (a) and (b)

10. N-queens problem is solved using

(a) branch and bound (b) backtracking
(c) both (a) and (b) (d) approximation algorithm

PART - B (5 x 2 = 10 Marks)

11. What are the features/qualities/properties of an algorithm?

12. State master's theorem.

13. Differentiate dynamic programming and greedy technique.

14. What is flow conservation requirement?

15. Define: State Space Tree.

PART - C (5 x 16 = 80 Marks)

16. (a) Discuss the fundamentals of analysis framework and notations used in algorithm design. (16)

Or

(b) Write the linear search algorithm and analyse for its best,worst and average case time complexity. (16)

17. (a) (i) Write an algorithm to perform binary search. Analyze the algorithm for best case worst case and average case. (8)

(ii) Solve convex-Hull problem using Divide and Conquer. (8)

Or

(b) Write a pseudo code for a divide and conquer algorithm for sorting the two unsorted array into a single sorted array with your own suitable data set. Setup and solve the recurrence relation for the number of key comparisons made by the algorithm. (16)

18. (a) Define spanning tree. Discuss the design steps in prim's algorithm to construct minimum spanning tree with an example. (16)

Or

(b) Define optimal binary search tree. Construct OBST for a set (a1, a2, a3, a3)= (cout, float, if, while) with probabilities p(1)=1/20, p(2)=1/5, p(3)=1/510, p(4)=1/20. (16)

19. (a) Describe in detail about outline of simplex method. Explain geometric interpretation of Linear programming with example. Trace the simplex method on the following problems.

Maximize $p= 2x-3y=4z$
Subject to $4x-3y+z<=3$
$x+y+z <=10$
$2x+y- z<=10$

where x, y and z are non negative (16)

Or

(b) Apply stable marriage algorithm, to the following instances and also construct a ranking matrix. (16)

Men's preferences				Women's preferences			
	1st	2nd	3rd		1st	2nd	3rd
Bob:	Lea	Ann	Sue	Ann:	Jim	Tom	Bob
Jim:	Lea	Sue	Ann	Lea:	Tom	Bob	Jim
Tom:	Sue	Lea	Ann	Sue:	Jim	Tom	Bob

20. (a) Define subset sum problem. Apply backtracking to solve the following instance of the subset sum problem. A = {3, 5, 6, 7} and d = 15. (16)

Or

(b) Apply Greedy algorithm steps, illustrate the following instances of the knapsack problem based on discrete and dynamic approaches. The knapsack capacity W = 10.

Item	Weight	Value
1	7	$42
2	3	$12
3	4	$40
4	5	$25

(16)