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

Question Paper Code: 44204

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 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. Recursive algorithms are based on

   (a) Divide and conquer approach (b) Top-down approach
   (c) Bottom-up approach (d) Hierarchical approach

2. Given two non-negative functions $f(n) = 5n^2 + 6n + 1$ and $g(n) = n^2$. Calculate upper bound value, C is

   (a) C = 5 (b) C = 6 (c) C = 12 (d) C = 11

3. The running time of quick sort depends heavily on the selection of

   (a) No of inputs (b) Size of elements
   (c) Arrangement of elements in array (d) Pivot element

4. 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

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

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(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. The Knapsack problem where the objective function is to minimize the profit is _____

(a) Greedy (b) Dynamic 0 / 1
(c) Branch and Bound 0/1 (d) Backtracking

PART - B (5 x 2 = 10 Marks)

11. What is the use of asymptotic notations?

12. Write an algorithm for binary search.

13. Differentiate dynamic programming and greedy technique.

14. Show the Mathematical formulation to solve a max flow problem.

15. Define: State Space Tree.

PART - C (5 x 16 = 80 Marks)

16. (a) Explain briefly about various fundamental steps used to design an algorithm. (16)

Or

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

17. (a) Apply Strassen's algorithm to compute

$$\begin{vmatrix} 1 & 2 & 1 & 1 \\ 0 & 3 & 2 & 4 \\ 0 & 1 & 1 & 1 \\ 5 & 0 & 1 & 0 \end{vmatrix} * \begin{vmatrix} 2 & 1 & 0 & 5 \\ 1 & 2 & 1 & 1 \\ 0 & 3 & 2 & 1 \\ 4 & 0 & 0 & 4 \end{vmatrix}.$$ (16)

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)

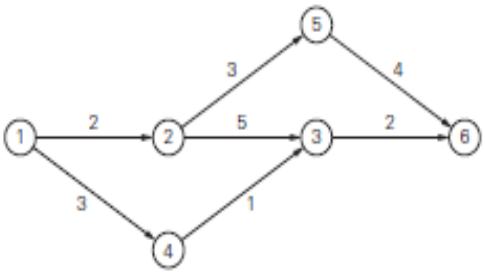
18. (a) Design a to find a solution for following instances of the knapsack problem using dynamic programming algorithm and memory function algorithm. Capacity W = 5. (16)

Item	Weight	Value
1	2	$12
2	1	$10
3	3	$20
4	2	$15

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) Apply the shortest-augmenting path algorithm to find a maximum flow and a minimum cut in the following networks. (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) Write short notes on NP-Hard and NP-Completeness. (16)