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**Question Paper Code : 80293**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Computer Science and Engineering

CS 6402 — DESIGN AND ANALYSIS OF ALGORITHMS

(Common to Information Technology)

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Design an algorithm to compute the area and Circumference of a circle.
2. Define recurrence relation.
3. Write an algorithm for brute force closest —pair problem.
4. What is worst case complexity of binary search?
5. What is meant by principle of optimality?
6. How to calculate the efficiency of Dijkstra's Algorithm?
7. Define the iterative improvement technique.
8. What is maximum cardinality matching?
9. Write the formula for decision tree for searching a sorted array.
10. State the reason for terminating search path at the current node in branch and bound algorithm.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Use the most appropriate notation to indicate the time efficiency class of sequential search algorithm in the worst case, best case and the average case. (8)
- (ii) State the general plan for analyzing the time efficiency of nonrecursive algorithms and explain with an example (8)

Or

- (b) Solve the following recurrence relations

- $x(n) = x(n-1) + 5$  for  $n > 1$ ,  $x(1) = 0$
- $x(n) = 3x(n-1)$  for  $n > 1$ ,  $x(1) = 4$
- $x(n) = x(n-1) + n$  for  $n > 0$ ,  $x(0) = 0$
- $x(n) = x(n/2) + n$  for  $n > 1$ ,  $x(1) = 1$  (solve for  $n = 2^k$ )
- $x(n) = x(n/3) + 1$  for  $n > 1$ ,  $x(1) = 1$  (solve for  $n = 3^k$ ). (16)

12. (a) There are 4 people who need to be assigned to execute 4 jobs (one person per job) and the problem is to find an assignment with the minimum total cost. The assignment costs is given below, solve the assignment problem by exhaustive search. (16)

	Job 1	Job 2	Job 3	Job 4
Person 1	9	2	7	8
Person 2	6	4	3	7
Person 3	5	8	1	8
Person 4	7	6	9	4

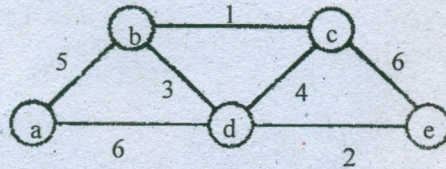
Or

- (b) Give the algorithm for Quicksort. With an example show that Quicksort is not a stable sorting algorithm. (16)
13. (a) Solve the all-pairs shortest-path problem for the digraph with the following weight matrix: (16)

0	2	$\infty$	1	8
6	0	3	2	$\infty$
$\infty$	$\infty$	0	4	$\infty$
$\infty$	$\infty$	2	0	3
3	$\infty$	$\infty$	$\infty$	0

Or

- (b) Apply Kruskal's algorithm to find a minimum spanning tree of the following graph. (16)



14. (a) (i) State and prove Max-Flow Min-Cut Theorem  
 (ii) Summarize the steps of the simplex method. (16)

Or

- (b) (i) Explain briefly about Stable marriage algorithm. (10)  
 (ii) Determine the time-efficiency class of the stable marriage algorithm. (6)

15. (a) (i) Draw a decision tree and find the number of key comparisons in the worst and average cases for the three-element bubble sort. (8)  
 (ii) Write backtracking algorithm for 4-Queen's problem and discuss the possible solution. (8)

Or

- (b) Solve the following instance of Knapsack problem by branch and bound algorithm. (16)

Item	weight	profit	
1	5	\$40	
2	7	\$35	
3	2	\$18	W=15
4	4	\$4	
5	5	\$10	
6	1	\$2	