

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**C 3194**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Third Semester/Fourth Semester

(Regulation 2004)

Computer Science and Engineering

CS 1201 — DESIGN AND ANALYSIS OF ALGORITHMS

(Common to B.E. (Part-Time) Second Semester – Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define an algorithm.
2. Design an algorithm for checking whether the given word is a palindrome or not i.e., whether the word is the same even when reversed. E.g., MADAM is a palindrome.
3. List out the steps for empirical analysis of algorithm efficiency.
4. What is the significance of Fibonacci number of sequence?
5. Give an example problem that cannot be solved by a Brute-Force attack.
6. Write a pseudo code for a divide and conquer algorithm for finding the position of the largest element in an array of  $n$  numbers.
7. Define a heap.
8. Give the pseudo code of the Warshall's algorithm.
9. When do you terminate the search path in a state-space tree of a branch and bound algorithm?
10. Define a Knapsack problem.

11. (a) (i) Elaborate the various asymptotic metrics used to evaluate the efficiency of the algorithm. (10)
- (ii) Use the most appropriate notation to indicate the time efficiency class of a sequential search. (6)
- (1) in the worst case
  - (2) in the best case
  - (3) in the average case

Or

- (b) Specify the Euclid's algorithm, the consecutive integer checking algorithm and the middle-school algorithm for computing the greatest common divisor of two integers. Which of them is simpler? Which is more efficient? Why? (16)
12. (a) Consider the following algorithm :

ALGORITHM Secret (A [0,...,n-1])

//Input : An array A[0,..., n-1] of n real numbers

minval ← A[0];            maxval ← A[0];

for i ← 1 to n-1 do

  if A[i] < minval

    minval ← A[i];

  if A[i] > maxval

    maxval ← A[i];

  return maxval-minval;

- (i) What does this algorithm compute? (2)
- (ii) What is the basic operation? (2)
- (iii) How many times is the basic operation computed? (4)
- (iv) What is the efficiency class of this algorithm? (3)
- (v) Suggest an improvement or a better algorithm altogether and indicate the efficiency class. If you can't do it, prove that in fact it can't be done. (5)

Or

- (b) Consider the following recursive algorithm for computing the sum of the first  $n$  cubes :  $S(n) := 1^3 + 2^3 + \dots + n^3$ ;

ALGORITHM S(n)

// Input : A +ve integer n;

// Output : The sum of the first n cubes.

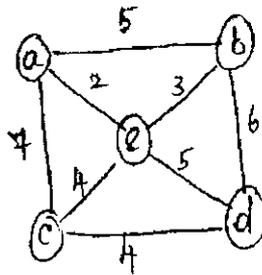
if n=1 return 1

else return S(n-1) + n\*n\*n

- (i) Set up and solve a recurrence relation for the number of the algorithm basic operation is executed. (8)
- (ii) How does this algorithm compare with the straight forward non-recursive algorithm for computing this function? (8)
13. (a) (i) Describe the Quick sort algorithm. (10)
- (ii) Apply Quick sort to sort the list E,X,A,M,P,L,E in alphabetical order Draw the tree of the recursive calls made. (6)

Or

- (b) Compare and contrast the Depth First Search and Breadth First Search algorithms. How do they fit into the decrease and conquer strategy? (16)
14. (a) (i) Describe the Prim's algorithm for finding the minimum cost spanning tree. (10)
- (ii) Apply the Prim's algorithm to the following graph : (6)



Or

- (b) For each of the following lists, construct an AVL tree by inserting their elements successively, starting with an empty tree.
- (i) 1, 2, 3, 4, 5, 6 (5)
- (ii) 6, 5, 4, 3, 2, 1 (5)
- (iii) 3, 6, 5, 1, 2, 4 (6)

15. (a) Using backtracking enumerate how can you solve the following problems :

(i) 8 – Queens problem. (8)

(ii) Hamiltonian circuit problem. (8)

Or

(b) (i) Solve the following instance of the Knapsack problem by branch and bound algorithm. (8)

Item	Weight	Values
1	10	\$100
2	7	\$63
3	8	\$56
4	4	\$12

$W = 16$

(ii) Give an example for the best case input for the branch and bound algorithm for the assignment problem. (4)

(iii) In the best case, how many nodes will be in the state space tree of the branch and bound algorithm for the assignment problem. (4)