

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI-600 034.
M.Sc. DEGREE EXAMINATION – MATHEMATICS
FOURTH SEMESTER – APRIL 2003
MT 4952/ M 1057 COMPUTER ALGORITHMS

26.04.2003

1.00 – 4.00

Max: 100 Mark

Answer ALL questions. Each question carries 25 marks

- I a) (i) Give procedure SEARCH to search for an element x in an array $A(1:n)$ and to return k if $a(k) = x$ and zero otherwise.
(ii) Give a recursive procedure to find GCD of 2 accepted numbers. (OR)
- b) Give a procedure to create a leap of n elements, inserting one item, at a time. (8)
- c) (i) Discuss: Analyzing algorithms in general
(ii) Explain the conditional statements and loop structures in SPARKS. (OR)
- d) Give HEAPSORT to sort numbers in an array. Simulate it on
 $A(1:6) = (14,17,25,12,13,7)$ (17)
- II a) Give procedure BINSRCH and simulate it on
 $A(1:7) = (45, 70, 82, 90, 95, 100, 110)$ when $x = 46$. (OR)
- b) Give procedure MAXMIN and find its best, worst and average least number of comparisons when n is a power of 2. (8)
- c) Give procedure MERGESORT
If the time for merging operation is proportional to n , then find the computing time – (n) for MERGESORT. When $n = 2^k$, prove that $(n) = O(n \log n)$ (OR)
- d) Give procedure SELECT to find the k^{th} smallest element in an array simulate it on
 $A(1:8) = (14, 12, 61, 60, 17, 20, 6, 10)$ to find the 3rd smallest element. (17)
- III a) Explain the problem of optimal storage on tapes. With usual notation.
if $l_1 \leq l_2 \leq \dots \leq l_n$ then prove that the ordering $i_j = j_i \leq n$ minimizes $\sum_{k=1}^n \sum_{j=1}^n l_{ij}$,
outing over all possible permutations of the i_j . (OR)
- b) State a greedy algorithm to generate shortest paths from a given vertex to all other vertices in a graph. (8)
- c) Give line procedure due to Kruskal to find a minimum spanning tree of a graph. Prove also that Kruskal's algorithm generates a minimum cost spanning tree for every connected undirected graph G . (OR)
- d) State procedure GREEDY– KNAPSACK. With usual notation, if $p_1/w_1 \geq p_2/w_2 \geq \dots \geq p_n/w_n$, then prove that GREEDY– KNAPSACK generates an optimal solution to the given instance of the knapsack problem. (17)
- IV a) Explain sum of subsets problem and give 2 different formulations for the same. (OR)
- b) Explain in detail how backtracking works on the 4 –queen problem. (8)
- c) (i) Give recursive backtracking algorithm for sum of subsets problem

(ii) State procedure MCOLO RING to find all m-colorings in a graph.

(OR)

d) Define a hamiltonian cycle. Give an example of (i) a hamiltonian graph.

(ii) Give algorithm HAMITONIANJ to generate all hamiltonian cycles in a graph (17)

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