2006-VISVESVARAYA TECHNOLOGICAL UNIVERSITY

B.E DEGREE EXAMINATION

ANALYSIS AND DESIGN OF ALGORITHAMS

(COMPUTER SCIENCE AND ENGINEERING)

TIME-3HOUR
MARK-80

ANSWER ANY FIVE QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS

1 a. Define O notation, ? notation and ® notation If f1(n) € O(g1(n)) and f2(n) € O(g2(n)), prove that f1(n) + f2(n) € O(max [g1(n), g2(n)]).

b. Develop an algorithm to determine the minimum and maximum values in an array a1,a2,.. .....an of integers (Here n>=1 and the entries in the array need not be distinct). Determine the worst case complexity function for this algorithm.

c. What is wrong with the following argument? Since n = O(n), 2n= O(n)..... we have ? Kn = ? O(n) =O(n^2).. 1<=k<= n 1<=k<= n

2 a. Design a brute force algorithm for computing the value of a polynomial p(x) = Anx^n+An-1x^n-1+.....+A1 x +A0 are given point x0 and determine its worst case complexity class.

b. If the algorithm designed in part (a) is in ®(n^2). design a linear algorithm for this problem.

c. Write a quick sort algorithm.Derive worst-case and average-case complexities for this algorithm.

3 a. Write a decrease -by-one algorithm o generate all 2^n subsets of a set {a1, a2,.....,an} in quashed order i.e. subset involving aj. can be listed only after all subsets involving a1, a2,.....aj-1 (j=1,2.....n-1)

b. Design a decrease -by- one algorithm for generating a gray code of order n.

c. Solve the system of linear equations given below by gaussian elimination:
2x1 - x2 + x3 = 1
4x1 + x2 - x3 =5
x1 + x2 + x3 =0

4 a. Define a heap.Prove that a n-element heap has height [log n]. Show that there is a linear algorithm to construct a heap of size n.

b. What is the running time of heapsort on an array A of length n that is already sorted in the increasing order? what about decreasig order?

5 a. What is input enhancement ? Apply this technique to design a linear sorting algorithm.

b. When does collision occur in hashing?What are different mechanisms used to resolve collisions?

c. Consider open hashing with linear probing policy. For the input : 1055,1492, 1776,1812,1918,1945 inserted in the order and hash function. h(k)=5k (mod 8)

i) Construct the open hash table

ii) Show the sequence of key comparisions needed to search for 1945 and 1543 in the table.

6 a. Write warshall's algorithm to find transitive closure of a diagraph. Prove that the time complexity of the algorithm is theta(n^3).

b. Apply warshall's algorithm to find transitive closure of a diagraph defined by the following adjacency matrix.

[0 0 0 0
0 0 1 1
0 1 0 0
1 0 1 0]

7 a. What is a decision tree? Use decision trees to establish lower bound on worst-case and average case efficiency of comparision based sorting algorithm.

b. Define NP-complete problem. Prove that the hamiltonian circuit problem is polynomially reducible to the decision version of travelling salesman problem. (TSF).

8 a. What is a C-approximation algorithm ? Write a 2- approximation algorithm for a TSP with a Euclidian distances.

b. If P ? NP . prove that there exists no C-approximation algorithm for TSP.