CSE 2012- Design and Analysis of Algorithms Practice Problem Sheet (Complexity-class : P. NP)

Practice makes you Perfect

1. Design an algorithm to decide whether the following problems belongs to the P-class or not.

    (a) Given two integers a, b, to find the greatest common factor of a and b.

    (b) Given a graph $G = (V, E)$, to compute the shortest path from a vertex v in V to a vertex u in V.

    (c) Given a graph $G = (V, E)$, to compute the Euler tour in G.

    (d) 2-CNF SAT Problem.

    (e) Finding the longest simple path in a graph G.

    (f) 0-1 knapsack problem

    (g) Fractional knapsack problem

    (h) String matching problem

    (i) maximal subarray problem

    (j) Problem of arranging n elements in a required way.

    (k) Chain-Matrix multiplication problem

    (l) Longest Common Subsequence Problem.

    (m) Activity selection problem

    (n) rod-cutting problem.

    (o) Maximum flow network problem

    (p) Primality testing problem

    (q) Tower of Hanoi problem

2. Design an algorithm to decide whether the following problems belongs to the NP-class or not.

    (a) CIRCUIT-SAT Problem

    (b) 3-CNF satisfiability problem

(c) Clique Problem in a graph

(d) Vertex cover problem in a graph

(e) Hamiltonian cycle problem in a graph

(f) Travelling-salesman problem.

(g) Subset-sum problem

(h) Longest simple cycle problem in a graph

(i) Set partition problem

(j) Graph isomorphism problem

3. Propose a problem p which belongs to the class-P. Design an polynomial-time algorithm to reduce this problem to another problem q which is also in class-P.

4. Propose a problem p which belongs to the class-NP. Design an polynomial-time algorithm to reduce this problem to another problem q which is also in class-NP.

Note: Certain problems are mentioned with their names alone , like Travelling salesman problem. Please refer the CLRS book to know the description of the problem.