2003 Paper 6 Question 11

Complexity Theory

(a) For each k, the k-clique problem is defined as the following decision problem:

> Given a graph G, does it contain a clique with at least k vertices?

Show that k-clique is in P for each k. [6 marks]

(b) The problem Clique is defined as the following decision problem:

> Given a graph G and an integer k, does G contain a clique with at least k vertices?

Show that Clique is NP-complete, using the assumption that 3-SAT is NP-complete. [10 marks]

(c) Explain why, if P=NP then there is a polynomial time algorithm for factorising numbers. [4 marks]