

2006 Paper 6 Question 12

Complexity Theory

- (a) Suppose that you were provided with a black box that could accept the language of sentences describing an integer k and a graph G with a k -clique, and the black box accepted such languages in polynomial time. Explain how you could derive a process that would accept satisfiable instances of the problem 3-SAT in polynomial time. [10 marks]
- (b) Suppose instead you had been provided with a black box that provided a polynomial-time acceptor for 3-SAT. Explain how you could use that to derive an efficient acceptor for the clique problem. [10 marks]

In your explanation the level of detail you are expected to give should be tuned to the level of complication in any transformations that you need to describe: simple ones should be described and justified in detail while elaborate or messy ones can be sketched and standard results quoted.