2009 Paper 6 Question 2

Complexity Theory

(a) Define precisely what we mean when we write $L_1 \leq_P L_2$. [4 marks]

(b) What is the difference between NP-completeness and NP-hardness? [2 marks]

(c) Let 3COL denote the following decision problem.

Given a graph $G = (V, E)$, is it 3-colourable?

(i) Is 3COL in NP? Why? [2 marks]

(ii) Show that 3SAT $\leq_P$ 3COL. [10 marks]

(iii) Argue that 3COL is NP-complete. [2 marks]