2008 Paper 13 Question 3

Complexity Theory

(a) Give definitions for the complexity classes SPACE(f) (for any function f); **L** and **NL**. [6 marks]

(b) Consider the following decision problem:

Reachability: Given a graph $G = (V, E)$ and two distinguished vertices $s, t \in V$, does G contain a path from s to t?

(i) Explain why **Reachability** is in the complexity class **NL**. [7 marks]

(ii) Show that if **Reachability** were in the class **L**, we would have **L** = **NL**. [7 marks]