2007 Paper 5 Question 9

Logic and Proof

- (a) You have to write a program that accepts a propositional formula ϕ and returns an interpretation that falsifies ϕ . Describe the algorithm you would employ in each of the following circumstances:
 - (i) ϕ can be expected to contain many occurrences of the \leftrightarrow connective. [4 marks]
 - (ii) ϕ will be delivered in disjunctive normal form. [4 marks]
- (b) Let S be a set of propositional clauses, each of which contains a negative literal.
 - (i) Show that applying the resolution procedure to S will never generate the empty clause. [3 marks]
 - (ii) Describe a model that satisfies S. [3 marks]
- (c) Prove or disprove the sequent $\Box \Diamond (P \lor Q) \Rightarrow (\Box \Diamond P) \lor (\Box \Diamond Q)$ of S4 modal logic. [6 marks]