

## 2007 Paper 5 Question 9

### Logic and Proof

- (a) You have to write a program that accepts a propositional formula  $\phi$  and returns an interpretation that falsifies  $\phi$ . Describe the algorithm you would employ in *each* of the following circumstances:
- (i)  $\phi$  can be expected to contain many occurrences of the  $\leftrightarrow$  connective. [4 marks]
  - (ii)  $\phi$  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  $\Box\Diamond(P \vee Q) \Rightarrow (\Box\Diamond P) \vee (\Box\Diamond Q)$  of S4 modal logic. [6 marks]