

## 1998 Paper 5 Question 10

### Logic and Proof

Construct an ordered binary decision diagram (OBDD) for the formula

$$[(P \rightarrow Q) \wedge (\neg R \vee \neg Q)] \rightarrow \neg R,$$

showing each step carefully. What does the OBDD tell us about whether the formula is (a) valid, (b) satisfiable and (c) inconsistent? [10 marks]

Attempt to prove the above formula using the sequent calculus until either it is proved or the proof cannot be continued. [4 marks]

Design a method for determining whether a propositional formula is inconsistent. The method should work by examining the formula's disjunctive normal form. Demonstrate your method by applying it to the formula

$$\neg[(P \wedge Q) \vee (Q \rightarrow P)].$$

[6 marks]