

2008 Paper 3 Question 6

Logic and Proof

- (a) Draw the BDDs for the formulae $(P \wedge Q) \rightarrow R$ and $(P \vee Q) \rightarrow R$, ordering the variables alphabetically. [2+2 marks]
- (b) Combine those BDDs to obtain the BDD for $[(P \wedge Q) \rightarrow R] \leftrightarrow [(P \vee Q) \rightarrow R]$. Briefly explain your working. [5 marks]
- (c) Use the DPLL method to determine whether or not the following set of formulae is consistent.

$$(Q \rightarrow R) \vee P$$

$$R \rightarrow (\neg P \vee Q)$$

$$(\neg P) \leftrightarrow Q$$

$$P \rightarrow R$$

[6 marks]

- (d) Use the sequent calculus to determine whether or not the following sequent is valid:

$$\forall x [P(x) \vee Q(f(x))], \exists y \neg P(y) \Rightarrow \exists y Q(y)$$

[5 marks]