

2010 Paper 6 Question 5

Logic and Proof

- (a) Write brief notes on the use of binary decision diagrams (BDD) to represent propositional formulae. Illustrate your answer by constructing the BDD corresponding to the formula $[p \rightarrow (q \wedge s)] \wedge [s \vee (r \rightarrow s)]$, ordering the variables alphabetically. [8 marks]
- (b) Exhibit a model for the following set of clauses, or prove that they are inconsistent:

$$\{\neg p(x, y), r(x, y), q(x), \neg p(y, x)\}$$

$$\{\neg r(x, y), \neg q(y), r(y, x)\}$$

$$\{r(x, y), \neg q(x), \neg q(y)\}$$

$$\{p(a, b)\} \quad \{p(b, a)\} \quad \{\neg r(a, b)\}$$

Here a and b are constants, while x and y are variables. [12 marks]