5 Logic and Proof (LCP)

(*a*) Proof methods for propositional logic include the sequent calculus, DPLL and BDDs. Describe briefly each of these methods. State, with reasons, which method is to be preferred for a problem that makes heavy use of the $\leftrightarrow$ and $\oplus$ symbols. (Note that $\oplus$ denotes exclusive or.) [7 marks]

(*b*) Describe briefly the procedure for constructing a BDD, illustrating your answer using the formula $((P \vee Q) \wedge R) \vee (P \rightarrow (Q \wedge R))$.

[7 marks]

(*c*) Consider the following set of $n + 1$ propositional formulas, where $n \geq 0$:

$$P_i \leftrightarrow P_{i+1} \qquad (\text{for } i = 1, \ldots, n)$$
$$P_1 \oplus P_{n+1}$$

Describe a possible execution of the DPLL procedure to determine whether this set is satisfiable or not. [6 marks]