

6 Logic and Proof (LCP)

(a) Describe how to test a propositional formula A for satisfiability, exhibiting a model if possible, based on

(i) converting A to disjunctive normal form

(ii) converting A to a binary decision diagram (BDD)

Briefly describe these alternative forms and state their respective advantages.

[6 marks]

(b) For each of the following formulas, present either a proof in a sequent or tableau calculus, or a falsifying interpretation.

(i) $[\forall x \exists y Q(x, y)] \Rightarrow \exists y Q(y, y)$ [4 marks]

(ii) $[\forall x (P(x) \rightarrow \neg P(x))] \wedge [\exists y P(y)] \rightarrow \exists y Q(y)$ [4 marks]

(iii) $\Box(A \vee B) \rightarrow (\Diamond \Box \neg A \rightarrow \Diamond \Box B)$ [6 marks]