

6 Logic and Proof (LCP)

- (a) Demonstrate the sequent calculus, the free-variable tableau calculus and resolution by using each of them to prove the following formula:

$$(P(a, b) \vee \exists z P(z, z)) \rightarrow \exists x \exists y P(x, y)$$

Comment briefly on the similarities and differences among these three methods. [12 marks]

- (b) Prove $\Box \Diamond P \rightarrow \Diamond \Box P$ using the sequent calculus for S4 modal logic, or exhibit a falsifying interpretation. [4 marks]
- (c) Briefly outline the procedure for converting a formula to a BDD, illustrating your answer by constructing the BDD that represents the conjunction of those below. [4 marks]

