1998 Paper 6 Question 10

Logic and Proof

Outline the concepts behind modal logic. Illustrate your answer by explaining the meaning of the axiom $A \rightarrow \Box \Diamond A$. [6 marks]

Attempt to prove, using rules for S4, the following sequents:

$$\Box(A \lor B) \Rightarrow (\Box A) \lor (\Box B)$$
$$(\Box A) \lor (\Box B) \Rightarrow \Box(A \lor B)$$

For each sequent, briefly explain why it is valid (or is not, as the case may be). [4 + 4 marks]

Use resolution to derive a contradiction from this set of clauses:

$$\{\neg P(x, x), P(x, a)\} \quad \{P(x, x), P(x, f(a))\} \quad \{\neg P(y, f(x)), \neg P(y, x)\}$$

[6 marks]