

2001 Paper 2 Question 9

Software Engineering II

(a) Describe, with examples, how the choice of programming language, programming tools and libraries can affect the reliability of the software developed using them. [5 marks]

(b) Consider the following pair of ML function declarations:

```
fun takew p [] = []
  | takew p (x::xs) = if p x then x :: takew p xs else [];

fun dropw p [] = []
  | dropw p (x::xs) = if p x then dropw p xs else x::xs;
```

Prove $(\text{takew } p \text{ } xs) @ (\text{dropw } p \text{ } xs) = xs$ using induction. (Assume that function p always terminates.) [8 marks]

(c) You have been asked to specify some banking software. A bank account has a *balance* and an overdraft *limit*, subject to the constraints $limit \geq 0$ and $balance + limit \geq 0$.

(i) Write a Z schema to specify the state of a bank account. [2 marks]

(ii) Write a Z schema for the operation to withdraw a given positive *amount* from the account. [5 marks]