

2003 Paper 2 Question 8

Software Engineering II

- (a) Present the top-down design of a program that generates calendars for a given month and year, as in this example:

```
October 2003
S M Tu W Th F S
      1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31
```

Express your program using a readable pseudo-code, carefully outlining the program's design. You may assume that primitives for weekday and date calculations are provided. [10 marks]

- (b) Consider the following ML function declarations:

```
fun app([], ys)      = ys
  | app(x::xs, ys) = x :: app(xs,ys);
fun nlength []       = 0
  | nlength (x::xs) = nlength xs + 1;
fun nrev []          = []
  | nrev(x::xs) = app (nrev xs, [x]);
```

Use structural induction (on xs) to prove the equations

- (i) $nlength(app(xs,ys)) = nlength xs + nlength ys$, and
(ii) $nlength(nrev xs) = nlength xs$.

[10 marks]