1995 Paper 12 Question 12

Introduction to Functional Programming

Consider the ML definitions:

```
fun I x = x
fun curry f x y = f (x,y)
fun uncurry f (x,y) = f x y
```

What are the types of `curry` and `uncurry`?   [2 marks]

Recall that f o g is the function that maps x to $f(g(x))$. Describe the effect of the following functions:

```
curry (fn(x,y) => x)
uncurry o curry
curry I
uncurry I
```
[4 marks]

Infinite lists can be represented in ML by functions. A function f represents the infinite list $f(0), f(1), f(2), \ldots$

(a) Give a representation for the infinite list $0, 2, 4, \ldots$ [2 marks]

(b) Code in ML a map functional for this representation; given a function f and the infinite list $x_0, x_1, x_2, \ldots$, it should yield the representation of $f(x_0), f(x_1), f(x_2), \ldots$ [2 marks]

(c) Code in ML a drop function, which given an integer $i \geqslant 0$ and an infinite list $x_0, x_1, x_2, \ldots$ returns the infinite list $x_i, x_{i+1}, x_{i+2}, \ldots$ [2 marks]

(d) Code in ML an interleave function, which combines the infinite lists $x_0, x_1, x_2, \ldots$ and $y_0, y_1, y_2, \ldots$ to yield $x_0, y_0, x_1, y_1, \ldots$ [3 marks]

(e) Code in ML a filter function, which given a predicate p and an infinite list $x_0, x_1, x_2, \ldots$ returns the infinite list obtained by deleting each x_i for which $p(x_i)$ is `false`.   [5 marks]