2002 Paper 9 Question 12

Specification and Verification II

The multiplexer `MUX`, register `REG c` (where `c` is the initial value) and combinational unit `COM f` (where `f` is the function computed) are defined to have the behaviour given below.

```
MUX(sw,i1,i2,o) = ∀t. o t = if sw t then i1 t else i2 t
REG c (i,o)     = (o 0 = c) ∧ ∀t. o(t+1) = i t
COM f (i,o)     = ∀t. o t = f(i t)
```

Using only instances of `MUX`, `REG c` and `COM f` design a device `DEV(c,f)` that satisfies

```
DEV(c,f)(reset,i,o) =
  (o 0 = c) ∧  ∀t. o(t+1) = if reset(t+1) then c else f(o t)
```

[8 marks]

Prove that your design meets this specification. [12 marks]