Assignment 1 - Combination Lock

due
Monday, January 31 2000

Question 1

This assignment asks you to design a digital combination lock. Your combination lock should be declared as follows:

```
entity EC_lock is port (
        signal button : in bit_vector(9 downto 0) ;
        signal reset, clk : in bit ;
        signal locked : out std_logic ) ;
end EC_lock ;
```

Change the first two letters of the entity name to match your initials.

The output 'locked' should be '1' to lock a door, '0' to open it.

Your circuit should behave as follows:

- when the reset button is pressed the door is locked
- if you then press the keys corresponding to the 8 digits of your student number, the door unlocks
- if the door is unlocked, pressing any digit or the reset button locks it
- if any key in the sequence is wrong the door will stay locked until the reset button is pressed again, regardless of what sequence of numbers is pressed

Your circuit should be synchronous and use only the one clock signal. Use only a single if statement and simple signal assignments in your process statements (see Lecture 1).

The clock frequency will be sufficiently high that there will be multiple clock edges for each button push. You will need to handle this (*hint: use a flip-flop to keep track of whether any buttons were pushed at the previous clock edge*).

Hand in your vhdl code, a block diagram of your circuit and simulation output that demonstrates the correct behaviour of your code. In particular, the simulation should show the inputs and outputs for the following sequences:

- the reset button is pressed and an incorrect sequence of 8 digits is pressed.
- the reset button is pressed, the correct sequence of digits (your student number) is entered and then any other button is pushed. There should be at least one number button press that extends over 2 clock cycles and one that extends over 4 clock cycles.
- the reset button is pressed, the correct sequence of 8 digits is entered except on the last digit an extra button (other than the correct one) is also pushed at the same time.