Due to Prof. Walker by 5pm on Friday 12 April 2002
this project counts as 15% of your course grade

Design an elevator controller for the Altera UP-1 board, and implement your design in AHDL

Assume that the elevator can go to any one of 16 floors, which are labeled 0 through 15 (assume we're in Europe, where 0 is the ground floor). Use one pushbutton and 4 DIP switches to enter a floor number and "call" the elevator to that floor — this simulates a person standing <u>outside</u> the elevator, who wants the elevator to stop on his or her floor. Use another pushbutton and 4 DIP switches to enter a floor number to "send" the elevator to that floor — this simulates a person standing <u>inside</u> the elevator, who wants to go to a particular floor. The elevator's current floor should continuously be displayed on the 7-segment displays, and the elevator should move slowly enough that its movement can be seen. One of the LEDs should indicate an open elevator door.

Start the elevator out on floor 0. A person on, say, the 9th floor should now be able to call the elevator, and we should see the elevator moving up floor-by-floor to the 9th floor. The door should open for a few seconds, that person should then enter the elevator, and send the elevator to, say, the 2nd floor, and again, we should see the elevator move to that floor and the door should open. *Get this part of the design to work* **before** *implementing the rest of the design as described in the next paragraph — a partial design that works is better than a more complete design that does not!*

Now consider what should happen as the elevator is descending from the 9th floor to 2nd floor as described above, if the elevator is called from outside. If the call is from, say, floor 4, the elevator should stop on that floor for a few seconds, before continuing on to floor 2 where it will await a new call or send signal (for convenience, let's assume the person entering will not input an additional destination, but will want to go to floor 2). If the call is from, say, floor 1, then the elevator should stop on floor 2 for a few seconds to discharge the original passenger, and then continue on to floor 1 (where it will await a new send signal from inside). Similarly, if the call is from floor 10, then the elevator should go to floor 2, discharge the passenger, and then go back up to floor 10 and await a new send signal from inside.

This problem could be made much more complicated, supporting additional passengers and requiring a queue to hold the requests, but you need not implement these additional complications.

Turn in:

a) a document that describes your design and any design decisions that you made (20 points)

b) a readable printout of the schematic and any appropriate timing analyses (10 points)

c) a printout of the test vectors and simulation output that shows that the circuit works as expected, annotated to explain to me what it is showing (20 points)

d) a signature on the statement below (print out this page) by Prof. Walker, by the TA (Meiduo Wu), or by *two* other students in the class (50 points):

I certify that _____ has successfully downloaded this design to a UP1 board and the design works correctly.

_____ Name   _____ Date

_____ Name   _____ Date