Assignment#: 3

(Due Date: May 22, 2024, (Wednesday), 0830 hrs (a report in .pdf and .smv file should be emailed to me by that time on masindhu@qau.edu.pk)

This assignment can be done in groups of two and will be evaluated on the basis of a viva. Both group members can end up with different marks depending upon the clarity or lack of it in the answers given.

Note that you should use your analysis for this assignment as it can be done relatively easily if you think yourself rather than browsing the internet for solutions as those may be more complicated including my own which is there. I want a simpler solution for this assignment from you.

Consider a 3-floor elevator vehicle which moves between the three floors in a chamber. It has inputs c1, c2 and c3 which stand for calls to floors 1, 2 and 3 respectively. These calls can be made from within the elevator vehicle or from outside panels fixed on each floor near the chamber. The door of the elevator is designed in such a way that it opens when it reaches a specific floor. The elevator has the property that it must reach the specific floor for which a call is made. You are required to ***design a deterministic Kripke structure model*** of the elevator by taking into account different inputs like the call to floors and different outputs like being on a specific floor or the door being open or shut and you must also fix the number of output bits. Another element that can be taken into account is the elevator being stationary or in motion. Code this model up in NuSMV. Then you are required to do the following:

Structural Coverage:

1. Write the structural coverage formulas in LTL for (NC and EC) on the Kripke structure graph model you created and encoded in NuSMV for the elevator.

Formal Verification:

2. Verify the behaviour of the elevator for the following properties by expressing these as LTL (in this case the goal is to have no counterexamples.)
    a) Whenever the elevator is not on a floor its door is closed.
    b) Whenever the elevator reaches a floor, its door opens.
    c) When a call to a floor is made the elevator will eventually reach that floor.
    d) The door remains open when the elevator is waiting on a floor.

Requirements Coverage:

3. For the properties given in Section 2 above, write their negated formulas (this will represent that the intended behaviour is missing in the elevator system) and find out and write the counterexamples received for these negated formulas (These will show the state sequence/input sequence to achieve the desired behaviour).