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Uva Wellassa University of Sri Lanka
Faculty of Science & Technology
Department of Computer Science & Technology
CST Degree Programme
Year II Semester II
End Semester Examination – September/October 2012

CST231-2 Microelectronics (lab)

Instructions
This is an open book exam.
No. of questions: One (01)
No. of pages: Two (02)
Time: Two hours (2 hr)
Total marks allocated: 20%

Index No:

Build a digital circuit for a car security system in Qucs and perform a digital simulation.

The system consists of sensors, a siren ans a master switch. The siren will activate when it is triggered by sensors:

A car door switch – D
A vibration detector switch – V

A master switch M will turn the system on or off.

When the door is opened D = 1, otherwise, D = 0.

When the car is being shaken, V = 1, otherwise, V = 0.

We want the siren S to turn on, that is, set S = 1, when either D = 1 or V = 1, or when both D = 1 and V = 1, but only for when the system is turned on, that is, when M = 1.

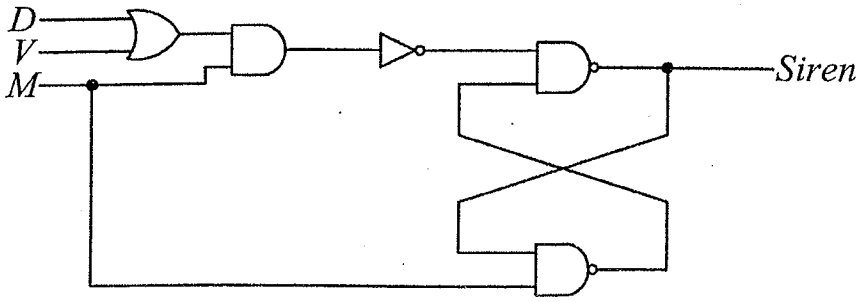
However, when we turn off the system, and either enter or drive the car, we do not want the siren to turn on. Hence, when M = 0, it does not matter what values D and V have, the siren should remain off.

If the siren is turned on, we want it to remain on, even after both the door and vibration switches are off.

In order to do so, we need to remember the state of the siren.

In other words, for the siren to remain on, it should be dependent not only on whether the door or the vibration switch is on, but also on the fact that the siren is currently on.

The circuit for the car security system:



Build this circuit in Qucs and perform a digital simulation for the time duration of 1000 seconds.

Create a timing diagram that will clearly show the following:

1. The diagram must show that the siren remains off when the master switch is off even if the door is open or the car is being shaken.
2. The diagram must show that the siren is turned on when the master switch is on and either the door switch or vibration switch is turned on.
3. The diagram must show that if the siren has turned on, it will remain on even after both the door and the vibration switches are off and as long as the master switch remains on.
4. The diagram must show that if the siren has turned on, it will turn off as soon as the master switch is turned off.

All this should be shown on a single timing diagram.