EE142--Digital Design

Project 2: TRAFFIC LIGHT CONTROLLER

Project overview:

Your task in this project is to design and simulate a traffic light controller. You should follow the given hierarchical design below, but you will be required to design each component on your own. ***You can use counters and comparators as blocks but you should design your own counter and comparator blocks.***

Project details:

Consider the crossroad in Figure 1. Your task is to design a traffic light controller for this crossroad.

In each road, there are sensors and counters. When a car enters a road, it gives a rectangular pulse to the associated counter. Traffic lights work with your design outputs, i.e., when you give '1', it means it is green, and when you give '0', it means it is red.

The main road is '1', i.e. traffic density is very high in this road, and you need to design a controller such that it prevents the traffic jam in this crossroad.

Please ensure the following rules for the controller:
- At any instant only one of the traffic lights can be green, and also they can not be all red at the same time.
- We have a threshold, '10', for the number of cars in the main road. If the number of cars in the main road is above this threshold, the light in the main road should be green, even if the number of cars in road II is larger than the number of cars in the main road.
- If the number of cars in the main road is below the threshold, the light in the road with more cars should be green. If the numbers are equal, the main road should be green.

Design hints:
- You need to design a counter such that it will count up if a car enters the road, and count down with a 1 Hz clock, if the light in this road is green, i.e., only one car can leave the crossroad in 1 sec. You need two of them, because we have only two traffic lights in this cross road, and the upper limit for the counter is '32'.
- You need two comparators such that one of them will compare the number of cars in the main road with the given threshold, and the other will compare the number of cars in roads I and II.

Grading policy:

- Working implementation: 40%
- Demo: 30%
- Report: 30%.

Please note that you are expected to design by using minimum number of gates.

Your report should include your design schematics, and it should clearly explain the design strategy, which is used in the project along with all necessary details (such as Karnaugh maps, block designs, hierarchical procedures, etc.). It is obvious that unethical behavior and plagiarism will not be tolerated. Please note that, your report must be **at most 4 pages long.**
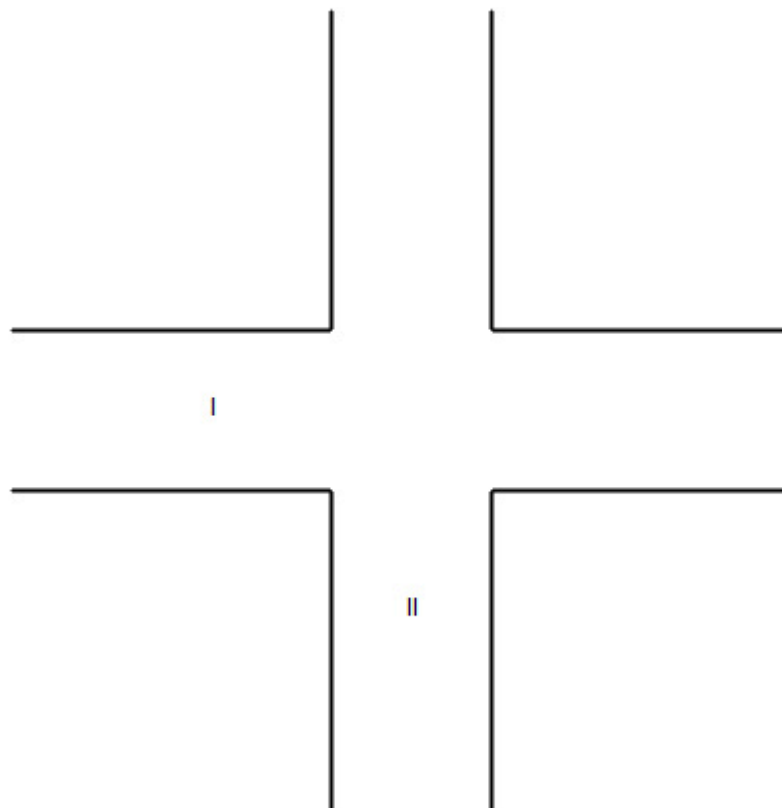

Figure 1