Lab/Assignment 3: Digital design for a given scenario (Car wash system).

Due Date 15th of March 2020 @ 3am

Objective:

- Design and test FSM design using the VHDL program.
- Design practice based on a specification.

Design Scenario and Specification

Using your knowledge in Combinational Logic Sequential Logic and Digital Timers, solve the problem for the given scenario.

Scenario:* '*Electronic Based Car Wash Controller'

NAPL petroleum services limited has planned to introduce automated car washing station facilities at their fuel stations. Each station is going to be equipped with the Deluxe Car Wash and Regular Car Wash facilities according to the customer needs, and this complete car washing system is controlled by an '*Electronic Based Car Wash Controller'*.

In this project, electronic design segment has been handed over to the Micro System Design Company to complete the '*Electronic Based Car Wash Controller*' design. You have been recruited by the company as an Electronic Engineer to develop this design using digital system.

Project Engineer has specified the entire system for regular car wash and deluxe car wash. And the complete system specifications are as follows;

Specification

According to token inserted to the system, system will identify the regular and deluxe washing conditions. If customer inserts 1 token and pushes "start", system identify regular wash condition and if inserts 2 tokens and push 'start' it identify as deluxe car wash.

System specifications for Regular Car Wash

- Once the system identified regular car wash condition, system immediately turns on water spray for first 10 s.
- After first 10 s wash brushers with the water spray will turn on for 20 s.

- Turn off water spray while and hold brushers work, only for 10 s time to complete the Regular Car Wash.
- Complete system should get turn off after 42 s total time.

System specification for Deluxe Car Wash

- Once the system identifies the deluxe car wash condition, system immediately turns on water spray for 10 s.
- After first 10 s, soap spray will turn on for next 10 s.
- After complete first 20 s, wash brusher will get turn on for next 10 s with soap spray.
- Turn off soap spray for next 20 s and retain the brusher on.
- Water spray, and wash brusher should work together for next 30 s.
- Finally turn off water spray and hold the brushers on for 10 s to complete the Deluxe Car Wash.
- Complete system should get turn off after 92 s.

Task 1 (10 Marks)

As an Electronic Design Engineer evaluate the complete design and design specification using block diagram(s). And draw a complete timing diagram for regular and deluxe car wash. (Assume single clock pulse generate 2s delay)

Task 2 (50 Marks)

According to the design specification draw a basic state diagram for regular car wash system.

Using design procedure complete and test the digital design for regular car wash system using VHDL code including test bench.

Task 3 (40 Marks)

Using complete design specification modify above state diagram to complete the '*Electronic Based Car Wash Controller*'

Using design procedure complete and test the design using VHDL code including test bench.

Deliverable

1. Design functional block diagram
2. VHDL code
3. Test bench if required
4. Output waveform.