**Scenario**

You are working in VALEO company developing in the field of embedded digital systems. Your manager asked you to work on some practical digital systems to meet the technical specifications required. You have to know how to divide large systems into subsystems with well defined inputs and outputs and the techniques used for system minimization using integrated circuits.

**Task (1):**

Design a digital system to meet the technical specifications for one system from the following list:

P3.1

* **Electronic door lock control system with:**
  + Four input switches.
  + Four code switches.
  + Green led for correct code entry.
  + Red led for wrong code entry.
  + Pseudo random counter enabled with wrong entry.
* **Adder with display:**
  + Full adder.
  + Save the state of addition even if the inputs are removed.
  + 7 segment display.
* **Four to one digital multiplexer system with a display for the selected channel:**
  + 4 x1 MUX.
  + Save the state of selection even if the selection inputs are removed.
  + 7 segment display.
* **Other digital system (must be accepted by your assessor).**

**Note:**

1. **Your design must include:**
   1. **System block diagram.**
   2. **Each block circuit diagram and its description.**
2. **Each system can be designed and implemented by no more than 2 students.**
3. **Your assessor will choose one system for you to work on.**

**Task (2):**

For the selected system (in task 1) realize, test and evaluate your system in terms of:

* Functionality.
* Chip count.
* Cost.

P3.2

**Task (3):**

Improve the design of the selected system (in task 1) be reducing the chip count by using programmable logic devices.

**Note:**

Your answer must contain:

* The programmable logic device chosen.
* The general description of the PLD used.
* The code (written or graphical) for the PLD used.
* Final conclusion of the system design reduction.

P3.3

**Task (4):**

Write the structure and approach you have been used in the testing process of your system selected (in task 1).

M3.1

**Task (5):**

Digital systems may suffer from many problems like:

1. The bouncing of the switches.
2. Problems arise due to the propagation delay time of the gates.

**Define each problem and propose your solution for each one.**

D3.4

**Task (6):**

1. Minimize your selected system design (in task 1) using programmable microcontroller using your simulator software.

**Your answer must include the following:**

* **Your proposed steps for the task.**
* **The time schedules for the steps you have proposed.**

1. Compare and give your final conclusion between the designs prepared in:
   * Task 2.
   * Task 3.
   * Task (6-A).

In terms of:

* Components count.
* Circuit complexity.
* Cost.

D2.2