Lab-2 (14th and 16th August)

ECE270 - Embedded Logic Design

Tasks to be performed in this lab with homework

1. Generate the Boolean expression for the following problem statements.
2. Implement them by data flow and behavioral model.
3. Compare the RTL schematic and resource utilization for both modelling schemes.
4. Verify the design on Zedboard.

Problem Statement 1

The control unit of a chemical process is required to control the temperature and the pressure inside a reactor by binary (ON/OFF) control of a Heater (H) and an inlet Valve (V) according to the following logic:

Heater is ON if the Temperature is Low and the Pressure is not HIGH.

Valve is Open if Pressure is Low and Temperature is not LOW.

In addition, the control unit has also to sound an Alarm (A) if the temperature and the pressure are either both LOW or both HIGH.

There are three possible ranges of temperature and pressure – LOW, NORMAL and HIGH. Define a suitable set of binary variables to represent the various considerations and obtain a Boolean expressions for the output variables H, V and A.

Problem Statement 2

A student has to decide whether he will buy old textbook (Y) or new textbook (Z) prescribed for a course he is going to take, based upon the following considerations:

(a) cost of the book – LOW/MEDIUM/HIGH,

(b) quality of the teacher – EXCELLENT/GOOD/AVERAGE,

(c) quality of lecture notes – GOOD/AVERAGE,

(d) the book being useful in other courses also – YES/NO,

He would like to buy the new book if the teacher is AVERAGE, and the book is useful in other courses also, he would prefer to buy the new book whatever its cost. If the book is useful in other courses, he would buy the new book in any case provided its cost is at least MEDIUM.

If the book cost is HIGH and teacher is AVERAGE then he will purchase the old book only if it is also not useful for other courses. If the teacher is reasonably GOOD or EXCELLENT and gives GOOD lecture notes then he will purchase the old book provided its cost is LOW.

Define a suitable set of binary variables to represent the various considerations and obtain a Boolean expression for the output Y and Z representing the decision to buy the book.