

## **EE 142 Project I : Air Conditioner System Design**

### **DEADLINE: March 31, 2020**

Please make sure that all your designs and print-outs are obtained using the simulator package, Xilinx Project Navigator. A simple tutorial for it is available on the website. Also you can get a copy of this software from the course's TA Mehmet Sinan Yıldırım (mehmetsinanyildirim@yandex.com). Please check your operating system of your computer whether it is appropriate for the version of the simulator package. The software is also available at EE department's computer lab. You should submit your work to the TA before the deadline of the project via TurnItIn. Submissions with a similarity index (compared to TurnitIN database) larger than 20% will not be accepted. Similarity between submitted reports will be assessed separately. Demonstration date will also be announced by the TA.

Cheating is strictly forbidden. If any similar project is detected, this will affect your grade and your future references. You must submit your reports through TurnitIN. The details are available in course syllabus.

### **Project Goals**

- 1- Start designing a digital system using digital components.
- 2- Get familiar with common combinational components such as MUX's and adders.

### **Project Description**

You are going to design a simple air conditioner system using schematic part of the Xilinx ISE 10.1 Software in this project. A general block of the design is given in Figure 1. An external device (Temperature sensor) measures the analog temperature signal and converts it to digital in order to digital processing.

The data that come from the sensor is 8 bit BCD coded 2 digit temperature measurement. The data is input to a logic block to be compared with the 2 user-set temperature thresholds,  $T_{low}$  and  $T_{high}$  (In the block diagram given below, the thresholds have been set arbitrarily as,  $T_{low}=20$ ,  $T_{high}=25$ ). If the temperature exceeds  $T_{high}$ , the cooling module is on; if it falls down under  $T_{low}$ , the heating system works and otherwise the air conditioner stands-by. Furthermore, these outputs will be connected to different warning lamps and each of these lamps will be activated when related output of each module is on.

There are also display modules in order to show the measured temperature value. The data come from the sensor is also an input of the display module. At first, you should design a BCD to 7-Segment code converter in order to drive the display accurately. You are also responsible for learning how a 7-segment display works. Actually, there are two different displays for the 2 decimal digits, and an additional display will be used to show the unit of temperature (ie. Celsius).

Make your design at the gate level using se only logic gates. (MUX is available)

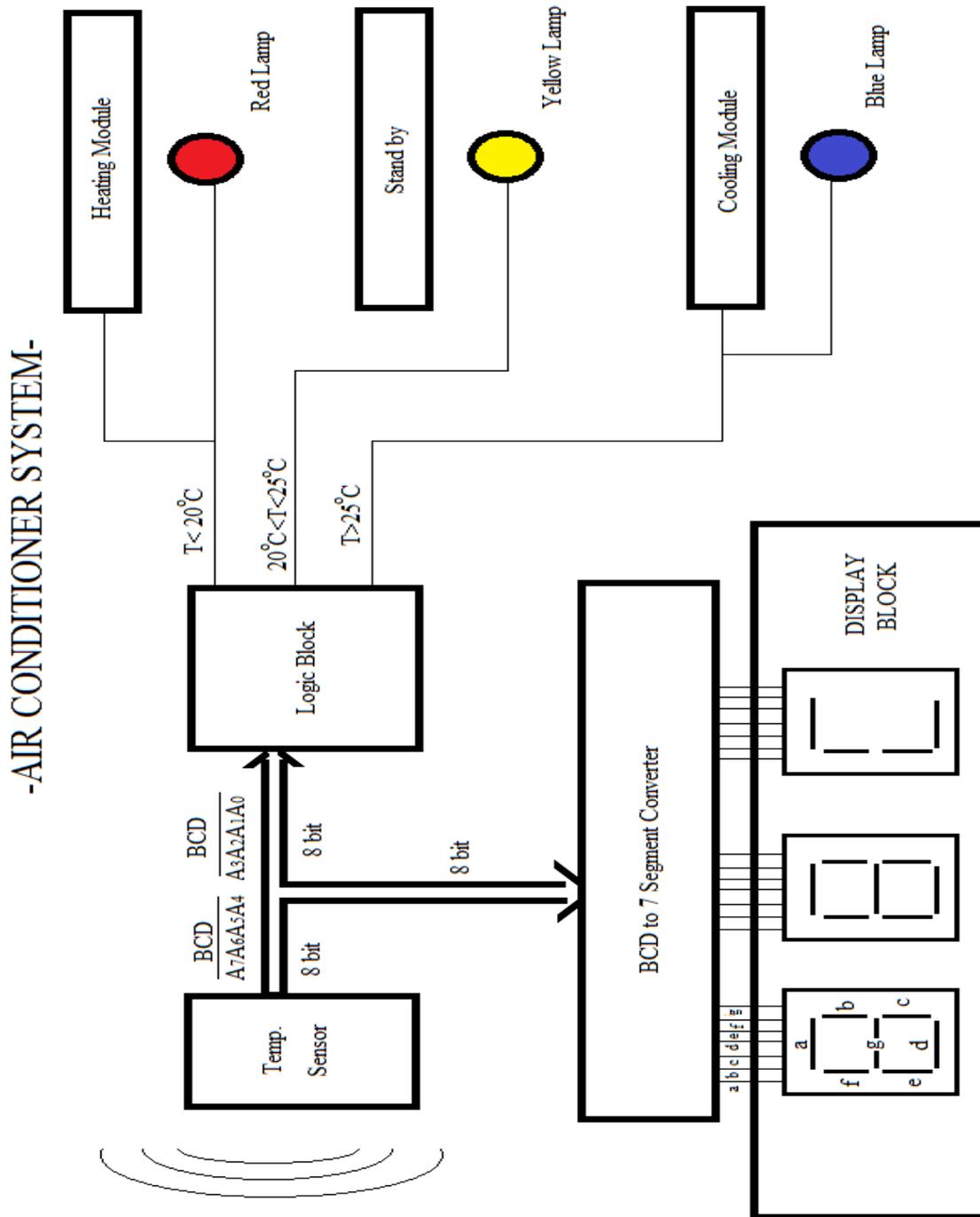


Figure 1. Block Diagram of the system