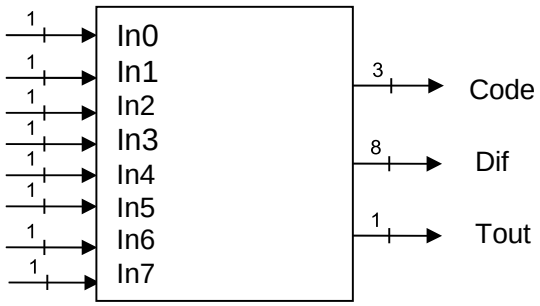
JUNE EXAM

Subject: Digital Systems and microprocessors.
Date: 10th of June of 2005 Year**2004/2005**

Problem #1. Control Alarm System

You need to design a system based on a Fujitsu microcontroller that controls an alarm system. The system has eight serial inputs (In[0..7]) where each input corresponds to the output of a system designed in the SSPE problem of the exam.



Inputs description

- The system has eight serial inputs **(In0..In7).** From each input, the system receives the serial information corresponding to an output of the eight systems of the exercise solved in the other problem of the exam. In other words, each input receives eight data bits plus a parity bit, a start bit and a stop bit. The time per bit is one millisecond. The inputs are not synchronized between them, and data can be received at any instant and. Moreover, it could happen that the system receives information in more than one input at the same time.

Outputs description

- **Code** is a 3 bits output that indicates codified in natural binary in which line an accident has been detected.
- **Dif** is a two's complement value received from the input indicated by Code.
- **Tout** is an output signal that needs to be activated during 2 mseg (raising edge) when the system detects an incidence at one of the inputs.

How does the system work?

The system is constantly receiving information from all the serial inputs.
When a value from one of the **In** inputs is bigger than **15** or smaller than **-15,** the system needs to output the value (codified in natural binary) of the input that has this difference at the output **Code** and the difference at the output **Dif.** Then, it needs to activate the output **Tout** during 2 milliseconds.
If the system detects that more than one input has a value greater than 15 or smaller than -15, it needs to display the outputs with the same order that it has detected and received the inputs.

To do:

1) Proposal and pinout connection of the inputs and outputs In and out Code, Dif, Tout.
2) Pseudocode of the whole program.
3) Implementation in assembly.

Some considerations:

1. The external Fujitsu clock runs at 16MHz.
2. If it is necessary, you can use interrupts to solve the exercise.