Microcontroller Laboratory – Edsim51 Simulator based Experimentation

What is Edsim51?

The 8051 Simulator for Teachers and Students

Installation:
Website: https://www.edsim51.com/

Click on link: "Prefer the original". This is a Java based simulator for 8051.

A number of interfaces can also be simulated with this – switches, LEDs, Keyboard, 7-segment display modules, ADC, DC motors etc. Thus, many experiments can be simulated in this environment. A number of examples have been included in the website. Those can be tested directly in the simulator.

Assignment 0: Install the simulator. You will need JAVA for running the simulator. If you do not have JAVA in your computer, you may download from the same website. Now try out the examples noted in the link "Examples" of the website. Go through the user manual to use the simulator.

Assignment 1: Write 8051 programs for the following
- Sort a set of 16 numbers stored at RAM locations 30 to 3F. Before running the program, edit those locations to input the numbers. Show the sorted output.
- Check if the bytes stored at locations 30H to 3FH constitute a palindrome or not. If the bytes make a palindrome, store 01H at location 40H, else store 0FFH at 40H.
- Convert the number stored at location 30H into BCD format. The digits of BCD be stored at locations 40H and 41H.

Assignment 2: Four-input Combinational Logic
The truth-table of a four-input combinational logic with inputs A(MSB), B, C, D(LSB) is stored at locations 30H to 3FH. Each location stores either a 0 or a 1 to represent whether the corresponding entry is FALSE or TRUE. For example, the location 33H will be 1 if the term A'B'CD is present in the function, 0 otherwise. Design a circuit that uses four LEDs to represent the inputs A, B, C, D and a fifth LED to represent the function output. Once the program initiated it will continually glow the LEDs in a cycle to show the input combinations 0000 to 1111 and the corresponding output.

Now, consider another input "sw0". If the switch is pressed, all the five LEDs should blink. Once the switch is released, the operation comes back to its normal mode starting at combination 0000. Change the content of memory locations 30-3FH to encode different combinational functions.

Assignment 3: Real-time minute-second clock / Stop-watch

Design a digital clock using the 7-segment display modules and a mode switch. The clock normally displays the time in mm-ss format. It updates time automatically using the timer interrupt of the microcontroller. On pressing the mode switch, the display changes to stopwatch mode in mm-ss format. In stopwatch mode there are two more buttons – start and stop. The start button starts the stopwatch resetting it to zero, stop button stops the stopwatch.

It should be noted that in the stopwatch mode, both normal clock and stopwatch clock get updated with timer interrupt. This ensures that the normal time also gets updated during the run of stopwatch. On pressing the mode button once more, the display returns to show clock time.

Assignment 4: **Waveform generation DAC**

Write programs to generate the following waveforms through the DAC interface:
(i) tangential,
(ii) trapezoidal,
(iii) saw-tooth,
(iv) sinusoidal.
Calculate the maximum frequency and amplitude that you could achieve in each case.

Assignment 5: **Study the UART interfacing program in the example set.**

From the interface, send your Roll Number in text format to 8051. Store the roll number in the bytes starting from memory location 30H. Now transmit your name from 8051 to UART interface and display in the interface.

WEEKLY EXPECTATIONS FROM STUDENTS:
1. Request for explanation about the steps for solving the questions/ code (TAs will not write code for you directly). Ask them freely if you have any relevant questions. Check whether you are understanding the lab questions.
2. Share screens (one student at a time), and discuss the progress/ problems with EdSim51 based simulations every week with respective TAs.
3. Receive marks (out of 10) individually for class performance after every class (all the weeks).
4. Submit a report (individually) every two weeks until we will complete the all assignments. The date/ deadline of submission corresponds to the start date for the next experiment/ exam. Late submissions and copy-pasted work will encounter penalties in marks.