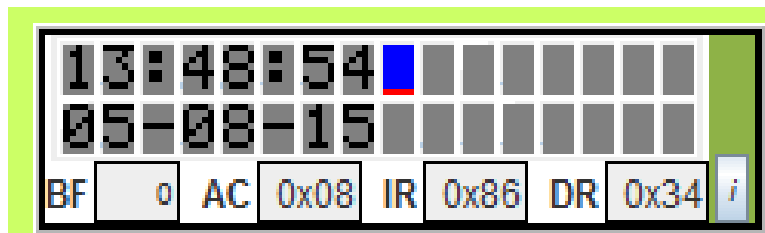


Assignment 4
Due Thursday, May 19th, 11:55pm.

Digital Clock

For this assignment, you are required to write code for a digital clock and test it in EdSim51. In this assignment, you are supposed to use timers, interrupts, keypad, switches and LCD. It should behave as follows:

The two lines on LCD should display the clock time (HH:MM:SS) on the first line, and date (DD-MM-YY) in the second line.



On power up, it starts from 00:00:00 (01-01-00 for the date) and increments once every second until 23:59:59 before wrapping around, then it increments the date. If DD reaches the limits, it wraps around and increments the month and so on. You should take care of the limits of the day DD based on the month and year. In other words, in February, the number of days is 28 and so on.

To be order to setup the time or the date, SW0/SW1 (using external interrupt 0/1) can be used to enter the time/date setting mode, where the time or the date can be setup using the keypad as following:

1. When you close the switch SW0 (connected to port pin P3.2), it enters the time setting mode, and the cursor should be shown on the digit being modified in line 1.
 - a) If [*] key is pressed, it moves the cursor to the left (or wraps around in the same line when the leftmost position is reached).
 - b) If [#] key is pressed, it moves the cursor to the right (or wraps around in the same line when the rightmost position is reached).
 - c) Typing the digit on the keypad causes the digit under the cursor to be set and the position to be moved to the right (or wrap around).
 - d) An invalid input digit at any position should not be accepted (e.g., the hour cannot be greater than 23; the minutes cannot be greater than 59, etc.).
2. When you close the switch SW1 (connected to port pin P3.3), it enters the date setting mode, and the cursor should be shown on the digit being modified in line 2.
 - a) If [*] key is pressed, it moves the cursor to the left (or wraps around in the same line when the leftmost position is reached).

- b) If [#] key is pressed, it moves the cursor to the right (or wraps around in the same line when the rightmost position is reached).
- c) Typing the digit on the keypad causes the digit under the cursor to be set and the position to be moved to the right (or wrap around).
- d) An invalid input digit at any position should not be accepted (e.g., the month cannot be greater than 12; the day cannot be greater than 31 or 30 or 28 depending on the shown month, etc.).

Rules and Guidelines:

1. The assignment code must be written in C-language and be fully compiled by either SDCC or Keil compilers.
2. The generated hex file should be fully functional on EdSim51.
3. You can start by studying the codes uploaded with this assignment (timer.c and interrupt.c) to understand the operation of both the timers and the interrupt. You can also utilize these codes in your assignment.
4. To be able to correctly compile any of your codes using SDCC compiler to work properly on EdSim51, you need to do the following 3 steps (some of these commands options may be not necessary as some of them are already the default values, you can refer to the SDCC manual for more information):
 - >> sdcc --model-small -mmcs51 --Werror -l. -c FILENAME.c
 - >> sdcc --model-small -mmcs51 --Werror -l. --iram-size 0x100 --code-size 0x1000 \
 - code-loc 0x0000 --stack-loc 0x30 --data-loc 0x30 --out-fmt-ihx FILENAME.rel
 - >> packihx FILENAME.ihx > FILENAME.hex
5. To be able to easily demonstrate the function of the clock, you can use a delay of around 100ms for the clock increment instead of the actual 1 second, and adjust the EdSim51 update Freq to 50000.

Turn In Requirements:

- You are required to turn in 2 files **in one zip archive**:
 - The C code (assignment5.c)
 - The generated hex file (assignment5.hex) that is compatible with EdSim51.
- You have to add comments to different parts of your file to describe your coding.