BOARD TEST

Revision 1.0

Due: Friday, March 1, 2019, 16:00:00hrs

*Submission: **via ODTUCLASS***

The take home examination (THE) aims to prepare you for subsequent THEs in this semester. To this end, you will

- acquire your MCDEV Development kits,

- test them with the supplied test code (`boardTest.hex`),

- exchange your kit with another one if you encounter any problems during the test,

- and report your observations by filling out and submitting the form you are given.

1-Hand Out Instructions

Download `boardTest.zip` from ODTUCLASS and extract it to the directory in which you plan to do your work. There are 2 files in this package:

- `boardTest.hex`, demo program you will be using to test your board.

- `group_##.log`, log file you will be updating during Board Test and submit to ODTUCLASS at the end. You should start by changing the "`##`" in the filename with your group number and update its `Part-1` with your group information.

- Other documents such as programming manuals, user guides are available under the manuals topic on ODTUCLASS.

Any clarifications and revisions to the assignment will be posted on the *ODTUCLASS* discussion form.

2 - Acquiring the MCDEV Development kit

Distribution of the kits will be done by Erol Öztaş in Z-05. He will be available in his office most of the time in Z-05 until the deadline. Please do not postpone this step until the last moment. Remember that it is your responsibility to acquire your board in a timely manner.

In order to acquire your kits, both group members should contact Erol Öztaş, together. During this process, both group members will need to sign a waiver form. **Please read the form carefully.** If both group members are not present, you will not be given your development kit.

Exceptions will only be done on VERY rare occasions such as serious health problem.

3-Testing the MCDEV Development kit

After acquiring your kit, you will need to test it to ensure that all of its features you need for your THEs are functional. For this purpose, you will first upload the `boardTest.hex` file to the PIC18F8722 microcontroller and then test your board following the steps detailed below. If you encounter any errors during programming or execution of demo program, please make sure to do the following:

- record and explain the error(s) you encountered in `Part-2` of your log file,

- exchange your kit with a new one by contacting Erol Öztaş,

- apply the test procedure to your new kit.

PLEASE make sure that you follow all instructions carefully. If you try to exchange a board which is later found to be functional, your homework grade will be reduced accordingly. The experimental boards are brand new, so it is VERY unlikely that they will be broken. We have tested all of them before they were given to you.

Note that you should use your log file to keep an accurate and detailed log of your work history. We will rely on these notes to diagnose any possible problems with the boards and fix them later.

In order to upload the demo program to the PIC18F8722, please carefully follow the procedures explained in the programming manual with Pickit2 and Pickit3. You can use one of them as a programmer and debugger. The Pickit2 module of some boards may not be executed, so please use the Pickit3 as a programmer and debugger. If programming is successful, update the log file accordingly. The proper switch setting is provided as "switchSetting-BoardTest.jpg" with this homework. The demo program should start to execute one you upload it to the microcontroller. The list below outlines what you should expect to see as the demo program executes. Record your experience and observations in your log file.

Step-0:

At first, the following message should appear on the LCD. If the message does not seem to appear or is very faint, adjust the LCD contrast by turning the contrast potentiometer (located on the right side of the LCD) to the left. If you still cannot see any results, you should try uploading the test code again, and then contact us if the problem persists.

```
STEP - 0

LCD
```

If everything is ok with this step, the program will automatically switch to Step-2 after a brief period. Just wait, you do not have to do anything.

Step-1:

This step checks your 7-Segment displays. First, you should see the following message on the LCD:

```
STEP - 1

7 Seg. Disps.
```

Then, the 7-Segment displays will show `88.:8.8.,` flashed three times. If everything is fine with this step, wait for Step-2.

Step-2:

In this step you will check the Analog to Digital Conversion (ADC) on your board. This step starts with the following message on LCD:

STEP – 2

ADC

Then the 7-Segment displays are updated with the current analog ADC value obtained from the blue potentiometer placed at the upper right corner of the 7-Segment displays. This value should be around 0 and 1023 when you turn the ADC potentiometer to its leftmost and rightmost positions, respectively. A range somewhere between 5 and 1018 is acceptable for the ADC value.

You have to turn the ADC potentiometer stick to its leftmost and rightmost positions and observe the acceptable range on the 7-Segment displays to pass to the next step. If you cannot observe the acceptable range, your ADC could probably faulty and you should request a change for the board.

Step-3:

In this step, the program will first show the following message on the LCD:

STEP – 3

LEDS

and then flash all the LEDs (except 21 of them) three times. It is normal that LEDs corresponding to RA6, RA7, RF8~RF15 and RG5~RG15 (a total of 21 out of 72 LEDs) will not blink. If there is non-working LED(s) except for the mentioned ones above, report them in the log file and change your kit. Otherwise wait the program to switch to Step-4.

Step-4:

In this step you will check the pushbuttons except for RG1~RG4 on the board. This step starts with the following message:

STEP – 4

BUTTONS

In this step, you should press all buttons except RG0-4 one by one and observe the corresponding LED turn on. If you press RG0 anytime, this will take you to the next step. Therefore, you should press RG0 only after you have checked all of the buttons (except for RG1~RG4).

We should also note that RB2, RC6, RD4~RD7 LEDs will already be turned on with low brightness. But, when you press the corresponding buttons their brightness will increase and you will still be able to control the buttons. Also, some of the LEDs can be on with full brightness preventing to observe button press, which is normal.

Some of the LEDs (such as RC4 LED on some boards) can response the button press with low brightness change; this is normal as long as you observe a brightness change on the corresponding LED. Also, RE6 button could active both RE6 LED and RC4; this is a known issue and it is not problem.

Step-5:

This step checks the serial communication with your board. But, before this step you should connect serial communication cable, you are supplied, between a PC's USB port and the board's USB UART 1 port (above 2x16 LCD, leftmost USB port). *It is not recommended to plug or unplug the USB cable while the board is powered on, the board or your PC can be damaged. So, be careful about this issue!*

The `Cutecom` program is installed on inek machines in the labs to be used in this step to observe characters sent to the PC and to send a character from PC to the board.

About Cutecom:

You can start it from command line by using the `cutecom` command. Here is a screenshot taken while testing a board:
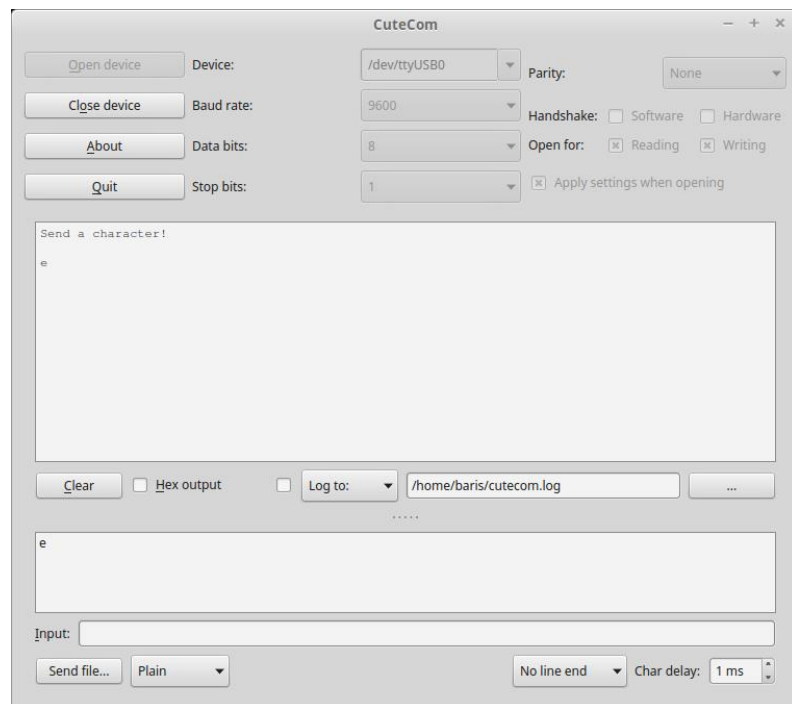
You will use the same settings during your test (Do not miss to select `No line end` from bottom right side of the window.). Serial device in the above settings is `/dev/ttyUSB0`. This device name is obtained from the output of `dmesg` command using terminal as seen in the following figure. You may need to change it if you observe a different device using `dmesg` command output upon plugging the USB cable.

```
[   86.448021] usb 2-2.1: New USB device found, idVendor=0403, idProduct=6001
[   86.448023] usb 2-2.1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[   86.448024] usb 2-2.1: Product: FT232R USB UART
[   86.448025] usb 2-2.1: Manufacturer: FTDI
[   86.448026] usb 2-2.1: SerialNumber: A602ECJX
[   86.468395] usbcore: registered new interface driver usbserial
[   86.468403] usbcore: registered new interface driver usbserial_generic
[   86.468408] usbserial: USB Serial support registered for generic
[   86.473049] usbcore: registered new interface driver ftdi_sio
[   86.473057] usbserial: USB Serial support registered for FTDI USB Serial Device
[   86.473080] ftdi_sio 2-2.1:1.0: FTDI USB Serial Device converter detected
[   86.473095] usb 2-2.1: Detected FT232RL
[   86.473096] usb 2-2.1: Number of endpoints 2
[   86.473097] usb 2-2.1: Endpoint 1 MaxPacketSize 64
[   86.473098] usb 2-2.1: Endpoint 2 MaxPacketSize 64
[   86.473099] usb 2-2.1: Setting MaxPacketSize 64
[   86.477427] usb 2-2.1: FTDI USB Serial Device converter now attached to ttyUSB0
[  194.892628] usb 2-2.2: new full-speed USB device number 5 using unci_hcd
[  195.020937] usb 2-2.2: New USB device found, idVendor=04d8, idProduct=0033
[  195.020941] usb 2-2.2: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[  195.020942] usb 2-2.2: Product: PICkit 2 Microcontroller Programmer
[  195.020943] usb 2-2.2: Manufacturer: Microchip Technology Inc.
[  195.020944] usb 2-2.2: SerialNumber: beti
baris@vm ~ $
```

Now coming back to your test, we assume that you safely plugged the serial cable, powered on the board, and `Cutecom` is open, its settings are properly adjusted and `Open device` button is clicked.

After repeating Step-0, 1, 2, 3 and 4, the demo program proceeds to Step-5, giving the following message:

STEP - 5

UART1

Then the program goes through the following steps:

- It updates the LCD with the message

STEP - 5

- It sends `Send a character!` string to the PC (and you should see this string on Cutecom windows as seen in the screenshot),
- It waits a character to be sent over serial port.

When you type, for example `2` to input line of Cutecom and then press enter, `2 received!` message should appear in LCD screen and also in the Cutecom below `Send a character!` string, since the character is sent back to the PC.

After receiving the character, your LCD screen should look like the following:

STEP - 5

2 received!

Now you can wait for the program to switch to Step-5.

Step-6:

This step checks your Piezo Buzzer. First, you should see the following message on the LCD:

STEP - 6

Piezo Buzzer

Then the Piezo Buzzer will start playing some melody. After playing the melody, the test

5

should restart from Step-0. If you come to this step and complete it successfully, it means that your board passed the all the tests and ready to use!

5-Hand In Instructions

You should submit your log file through ODTUCLASS. **Only one group member must submit the log file by considering the naming issue explained in section-1, otherwise you will lose partial points.** It should include all of your history during Board Test. This is one of the most crucial point of Board Test since the log files will be used to repair non-working boards and to electronically store the information about which group has taken which development kit.

Take your development kits as soon as possible; do not postpone it to the last day!

6-Grading

Board Test constitutes **2%** of your total grade stated in the syllabus. To be able to get a full grade (100 points) you should

- acquire your development kit on time, before the deadline
- test it,
- exchange it in case of a problem until getting a fully working development kit again in time,
- submit a log file properly filled with all of your Board Test history and explanations about the errors if you encounter any.

Groups who did not acquire their boards on time, or did not submit their log file will get a **zero** grade.

If you acquired the kit, but did not submit your log file, your grade will be reduced substantially, probably very close to zero.