

EXAM 1

EC463 (Spring 2012)

Name _____ Date: _____

You will be given a total of **1 hour 50 minutes** to complete this exam. You will be permitted to use the course website and all Quartus tools during this exam.

A project has been created for this exam, download the exam1_project.zip file and extract it to a working directory (eg. C:/EC463/lastname/exam1). This project includes a DE2_70_TOP top level entity and a nios_system as shown in Fig. 1. The nios_system **has been generated** for you. A project for Altera Monitor Program has also been created for you in the app_software sub-directory. This Altera Monitor Program project links to the "exam1_question1.c" file. This program simply put a string of ascii characters to the terminal window using JTAG_UART peripheral. The function *put_jtag* is provided to output one ascii character.

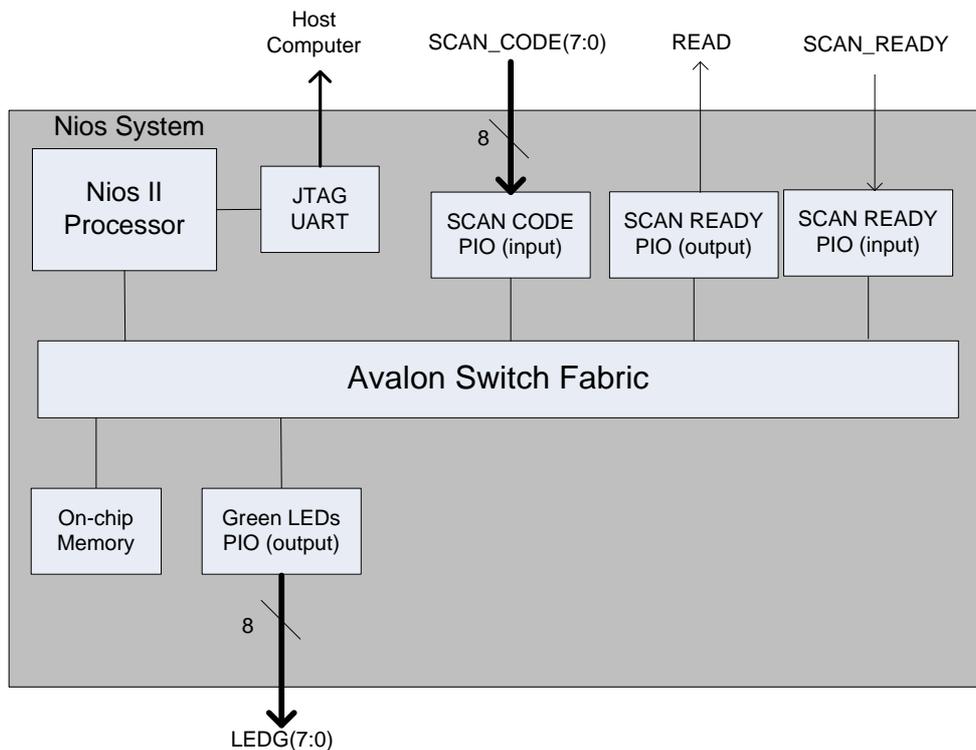


Fig. 1. Nios system

- (30 points) Review all the peripherals that are included in the nios system. Instantiate a nios_system and a keyboard controller (keyboard.vhd is provided in the same folder) in the DE2_70_TOP file and compile it. Run the provided “exam1_question1.c” on your hardware. The message

```
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>
```

should appear in the terminal window within the Altera Monitor Program. Demo this to your instructor.
- (30 points) Modify the c program to include a function that will accept a valid scan code of a PS2 keyboard key from the list below and return the corresponding ascii character for the that key.

PS2 Key	Scan code (hex)	Ascii character
Key 11	45	0
Key 2	16	1
Key 3	1e	2
Key 4	26	3
Key 5	25	4
Key 6	2e	5
Key 7	36	6
Key 8	3d	7
Key 9	3e	8
Key 10	46	9
Key 105	7b	-
Key 106	79	+
Key 13	55	=
Key 43	5a	New line
Other keys	--	E

Your function should have the following declaration:

```
char scan_code_2_ascii(int c);
```

Un-comment lines **22-37** to test your new c code. The following message should appear in the terminal:

```
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>1234567890-+=E
```

Demo this to your instructor. Print out and submit your c code.

- (40 points) Modify your c program to read a scan code from a ps2 keyboard and display a corresponding character in the terminal. Also, display the last scan code on the green leds (8 bits). Demo this to your instructor. Print out and submit your c code.
- (10 points) **Bonus question:** Implement a simple calculator to support add and subtract operations. Commands are entered using a ps2 keyboard. Commands and results should be visible in the terminal window. For example, if one enters “1+2=” from a PS2 keyboard, the terminal displays should show on a new line: 1+2=3. Demo this to your instructor. Print out and submit your c code.

Summary (include a copy of your code):

1. Successful Completion: Yes ____ No ____

Comment:

2. Successful Completion: Yes ____ No ____

Comment:

3. Successful Completion: Yes ____ No ____

Comment:

4. Successful Completion: Yes ____ No ____

Comment: