**CE 3544: Digital Design I** Project 5 Validation Sheet (Page 1)

GTA Validation Instructions:

Program the FPGA on the DE1-SoC Board with the student’s implementation, then perform the tests described below. Apply the values to the switches and/or press the key as indicated, reading from left to right. In general, the first value represents the opcode, the second value represents operand A, and the third value represents operand B. For each step, record the value of HEX[3:0] as the **Result**.

HEX[3:0] should not change its value while the switches are being changed. If they do change, make a note in the comments section. HEX[3:0] **can** change while KEY1 or KEY0 is being pressed.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SW[3:0]** |  | **SW[7:4]** | **SW[3:0]** |  | **SW[7:4]** | **SW[3:0]** |  | **Result** |
|  |  |  |  |  |  |  | KEY0 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 0000  (AND ID) | KEY1 | 1111 | 1111 | KEY1 | 0000 | 0000 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 0000  (AND ID) | KEY1 | 0000 | 0000 | KEY1 | 1111 | 1111 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |

If the previous two results do not show the first two digits (followed by two zeroes) and the last two digits (preceded by two zeros) of the last four digits of the student’s Virginia Tech ID number, **STOP THE VALIDATION.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0001  (Add) | KEY1 | 0110 | 1010 | KEY1 | 1100 | 1001 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 0010  (Subtract) | KEY1 | 0011 | 1100 | KEY1 | 0110 | 1001 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 0011  (Negate) | KEY1 | 0101 | 0110 | KEY1 |  |  |  | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 0100  (NAND) | KEY1 | 0011 | 0101 | KEY1 | 0110 | 0011 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 0101  (NOR) | KEY1 | 0101 | 0011 | KEY1 | 0011 | 0110 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 0110  (XOR) | KEY1 | 0110 | 1010 | KEY1 | 1100 | 1001 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 0111  (1’s C) | KEY1 | 0101 | 0110 | KEY1 |  |  |  | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 1011  (CSR) | KEY1 | 1100 | 0010 | KEY1 | 0000 | 0011 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 1010 (CSL) | KEY1 | 0011 | 0101 | KEY1 | 0000 | 0101 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |

**The validation continues on the next page.**

**ECE 3544: Digital Design I** Project 5 Validation Sheet (Page 2)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SW[3:0]** |  | **SW[7:4]** | **SW[3:0]** |  | **SW[7:4]** | **SW[3:0]** |  | **Result** |
| 1001  (ASR) | KEY1 | 1000 | 0010 | KEY1 | 0000 | 0100 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 1000  (ASL) | KEY1 | 1111 | 1011 | KEY1 | 0000 | 1010 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
| 1100  (Multiply) | KEY1 | 0101 | 1100 | KEY1 | 0011 | 0111 | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
|  |  |  |  |  |  |  | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
|  |  |  |  |  |  |  | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
|  |  |  |  |  |  |  | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
|  |  |  |  |  |  |  | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
|  |  |  |  |  |  |  | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
|  |  |  |  |  |  |  | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
|  |  |  |  |  |  |  | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |
|  |  |  |  |  |  |  | KEY1 | \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ |

Comments (only required if something is unusual or wrong):