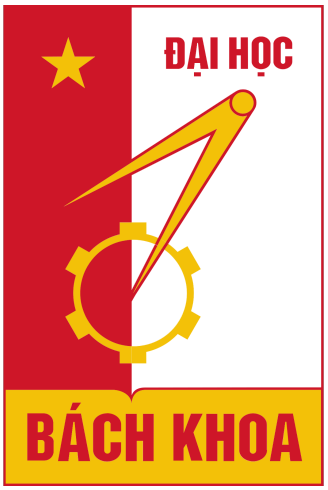
HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING



DESIGN SPECIFICATIONS

LAB1

Module Control 4 7-segment LEDs Using Switches

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1 Top module

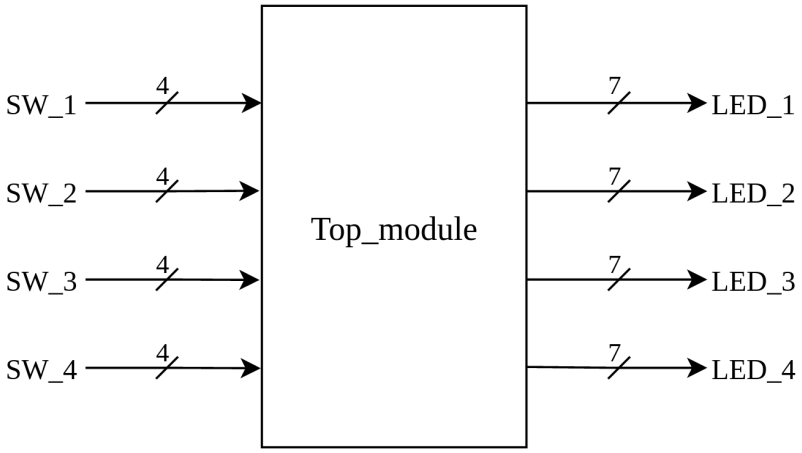

Figure 1: TOP module

2 Port description

Signal name	Width	I/O	Description
SW_1	4	Input	Group 4 switches encoding value that LED_1 displays in BIN format
SW_2	4	Input	Group 4 switches encoding value that LED_2 displays in BIN format
SW_3	4	Input	Group 4 switches encoding value that LED_3 displays in BIN format
SW_4	4	Input	Group 4 switches encoding value that LED_4 displays in BIN format
LED_1	7	Output	Group 7 bits controls 7-segment LED_1
LED_2	7	Output	Group 7 bits controls 7-segment LED_2
LED_3	7	Output	Group 7 bits controls 7-segment LED_3
LED_4	7	Output	Group 7 bits controls 7-segment LED_4

Table 1: Port description of top module

3 Functional Descriptions

- Module have 4 groups of 4 bits BIN inputs and 4 groups of 7 bits output lines (one for each LED).
- The status of each switch is read and sent to **SW_1**, **SW_2**, **SW_3**, **SW_4** (port's width is 4, associate with state of group of 4 switches).
- Each group **LED_1**, **LED_2**, **LED_3**, **LED_4** controls the display of a 7-segment LED base on decimal value of associated input SW_1, SW_2, SW_3, SW_4.
  - Per group contains 7 bits, each controls a segment of a ***common anode*** 7-segment LED (if a bit has logic value 0, the associated segment is light).
  - If decimal value of associated input is greater than 9, all the segment of associated LED is **off**.
- 4 LEDs work independently.

4 Timing Diagram

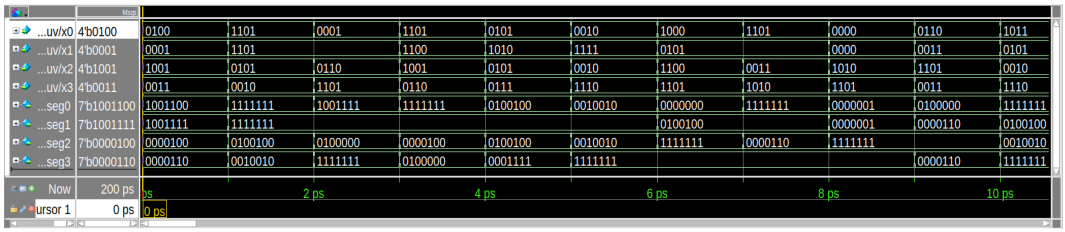

Figure 2: Timing Diagram of top module (randomly generated input)