COE3DQ5 – Lab #1 Report

Group number

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1. To achieve this effect, a reset select condition is added when assigning value_7_segment signals and led_green signals to output SEVEN_SEGMENT_N_O and LED_GREEN_O.
2.
    - In *always_ff* statement (line 137 ~ 168), count_down signal is decided to be HIGH when push button 2 and LOW when push 1 or resetn. When entering freezing mode and *push_button* 3 is pushed to unfreeze the system, count_down will be flipped to avoid overflow (00 → count up, 59 → countdown).
    - To decide flag signal (when to freeze): an *always_comb* combinational logic is used to decide if BCD0 and BCD1 are either 5/0 and 9/0, if the flag will become HIGH, otherwise it always stays LOW. Count_down is used to avoid falsely entering freezing mode right after dessert resetn (just have 00 and then freeze situation)
    - Two 4 bit counter are used: BCD0 and BCD1. In an *always_ff* statement, when stop_count and flag signals are both LOW, the counter mechanism around BCD0 and BCD1 starts working. When count_down is HIGH, BCD0 will add up to 9. When BCD0 reaches 9, it will be reverted back 0 meanwhile BCD1 counted up by 1. Similarly, when count_down is LOW, BCD0 <= BCD0 - 1. Once BCD0 is 0 it will back up to 9 and BCD1 is subtracted by 1 at the same time. Otherwise, BCD0 and 1 will always hold their previous value.
3. The encoder reads the value from ports, starting from switch 0 to 15, in order to encode the position of the least significant switch. The hex value is converted to the leftmost 7-segment-display. *pushed_button* stores the position value of the latest button pushed. It is updated once a valid pushed button is detected. if *pushed_button* is still the initial value, 7-segment-display is not lighted.
4. For this question, a new module called *switch_to_led* is created. Within this module, a 5-bit switch input and 3-bit output are defined. *led_out[2]* will be all 4 bits ORed together, *led_out[1]* is all 4 bits ANDed together while *led_out[0]* is all 4 bits XORed together to achieve an odd number of the switch on assert LED. In top-level file *experiment 5*, this module is called 3 times (set0, set1, set2) with different input and output.