Lab 5- Combinational Circuits (III): Using “Port Map”

The goal of this lab is to design combinational circuits using component and port-map statements. This design style is useful in hierarchical design for large circuits.

Lab 5.1:

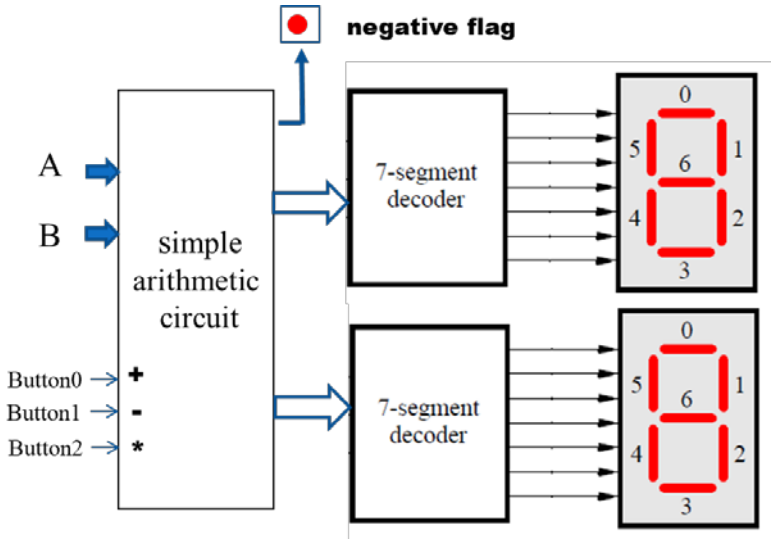
A 4-bit key-controlled arithmetic circuit.

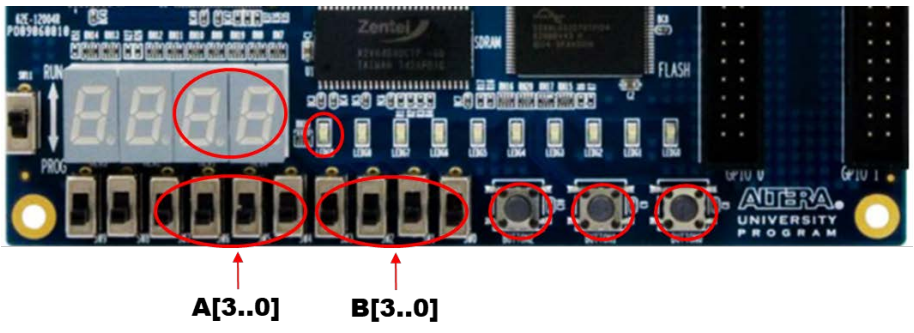
Given two 4-bit **signed** binary numbers A and B, a key-controlled arithmetic circuit is operated as follows,

- When Button0 is pushed, decimal value of A+B is shown on 7-segment displays.
- When Button1 is pushed, decimal value of A-B is shown on 7-segment displays.
- When Button2 is pushed, decimal value of A*B is shown on 7-segment displays.
- If the arithmetic result is **negative**, LEDG[9] is ON.
- For other cases, nothing is displayed.

- To avoid overflow, be sure to declare enough bits for the arithmetic operations in your code. For example, read in A and extend its sign-bit.
- This time, you are ***required*** to build a (BCD) 7-segment decoder first, and use it as a component in your design. (Practice the usage of component and port map.)

Tip: One way to do binary arithmetic is to convert signed number to integer first, do computation, and then convert back to signed number.





Lab-report:

Submit a lab report on **ilearn** by 11:00pm the day before of next lab. (The lab report must be a **PDF** file.) Your Lab report should include the following items:

1) VHDL code for the 4-bit key-controlled arithmetic circuit.

2) observations and comments.