EE214 - Digital Circuits Lab

BCD Number Addition

Thursday Batch

25/08/2022

Instructions:

1. For the design part do pen-paper design and get it verified by your TA.
2. In pen paper design use proper labeling for each wire. And use same labels for the VHDL code.
3. Perform RTL simulation using the provided testbench and tracefile.
4. Demonstrate the simulations to your TA
5. For reference you can go through this link: BCD Addition
6. Perform the experiment on Xenon board and verify with your TA.
7. Submit the entire project files in .zip format in moodle.

Problem Statement:

1. Design a circuit on pen paper for addition of two BCD numbers using two 4 bit binary adder-subtractor and additional logic gates from Gates.vhdl. Input numbers are BCD(0 to 9) format only. [5 Marks]

   Hint:

   (a) Use 4-bit binary adder for initial addition.
   (b) Design a logic circuit to detect sum greater than 9.
   (c) One more 4-bit adder to add $(0110)_2$ in the sum if sum is greater than 9 or carry is 1.

2. Write a VHDL description for the same. [5 Marks]
3. Simulate the BCD Adder using the generic testbench and given tracefile to confirm the correctness of your design and show simulation reults to your TA. [5 Marks]
4. Tracefile format: ($< A3\ A2\ A1\ A0\ B3\ B2\ B1\ B0 >\ < Y4\ Y3\ Y2\ Y1\ Y0 >\ < 1\ 1\ 1\ 1\ 1 >$) Tracefile
5. Pin plan switches S8 to S1 as input and LEDs as output and show the correctness of the design on board to your TA. [5 Marks]