EC6101D Digital System Design using HDL
Lab Assignment - 3

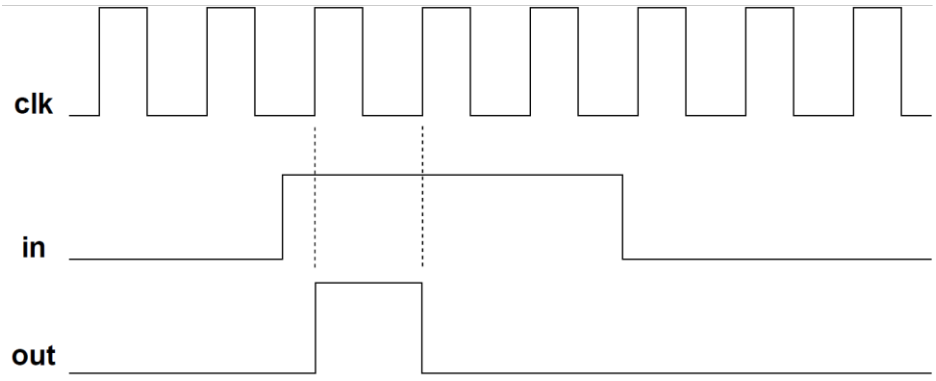
Guidelines for preparing report:

1. Start preparing your report well in advance instead of doing everything close to the dead line.
2. Report should contain Question, Gate level Circuit diagram and/or Truth Table/Boolean equation/State table/State diagram, Verilog Code including testbench and Simulation Waveform.
3. Testbench is mandatory for all the designs.
4. Use the font **`Courier New size 10 Bold`** for Verilog code with single line spacing.
5. Use font Times New Roman, size 12 for text, 14 for headings and single line spacing.
6. Do all the simulations and prepare the report on your own. If found to be copied, marks will not be awarded for Lab Assignments.
7. Use the cover page template available in the LMS.
8. Submit the report in pdf format only. File name format should be **"Shortname_RegNo_Lab_Report_2.pdf".**
   Example: Rahul_M210656EC_Lab_report_3.pdf
9. Additionally for this assignment, Verilog code (.v files only) of the design and testbench kept in separate folders for each question is to be submitted in a single '.zip' file format along with the report.
   Example: Rahul_M210656EC_Lab_3_verilog_code.zip

Lab Exercises

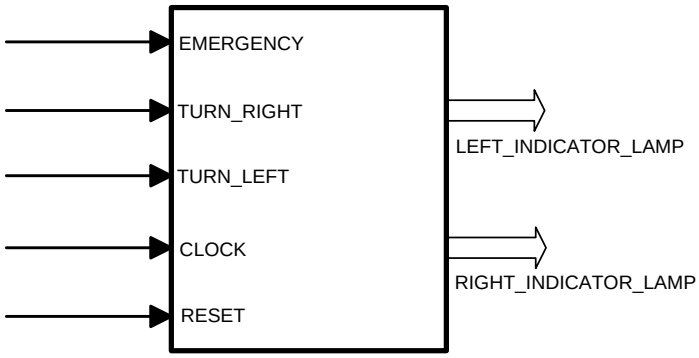
1) Design a non-overlapping sequence detector which detects the pattern "1100" from an incoming serial stream of bits. Assume the order of LSB being received first. Draw the Moore state diagram. Write Verilog code including testbench using separate always blocks for sequential and combinational part.

2) Design a FSM (Mealy) for rising edge detector which generates a short one clock cycle pulse when the input signal changes from '0' to '1'. Write Verilog code for the design and testbench. Sample input and output are shown in the figure below.



3) Design a vehicle tail lamp controller. There are 3 lamps on each side (left and right side) of the vehicle. Two inputs TURN_LEFT and TURN_RIGHT indicate the driver's request for a left turn or a right turn. The light flash sequence is 0,1,2,3,0,1,2,3,…. There is an EMERGENCY input which indicates emergency mode and all the six lamps (both left and right) should flash in the sequence 0,1,2,3,2,1,0,1,2,3,2,1,0,…. Left and right should flash simultaneously. In emergency mode the rate of flashing should be double that of the flashing in TURN_LEFT or TURN_RIGHT mode. The block diagram of the controller and the light flash sequence are shown below.

Block diagram



Light Flash Sequence: