Experiment 8

Design and implement a 2-bit counter that counts in the cyclic Grey codes

$$00_2\ 01_2\ 11_2\ 10_2\ 00_2\ 01_2\ ...$$

The counter accepts two synchronous control signals to set and clear the count, as described below.

SET	CLR	Z^+	Action
0	0	Z+1	Up count
0	1	00	Clear count
1	0	11	Set count
1	1	-	Illegal input

Design your synchronous circuit as a Moore machine using JK flip flops with asynchronous preset and clear.

Task: Develop the counter's state diagram/table and perform state assignment using Armstrong Humphrey Rules.

Deliverable (D1): State diagram and state table with state assignment.

Task: Design/develop the counter's combinational parts.

Deliverable (D2): Next state K-maps, JK FF input K-maps and the output K-maps. Minimized equations for JK FF inputs and for the outputs. Annotated logic schematic for the sequential circuit (both combinational parts and memory).

Task: Develop a structural VHDL model of the sequential machine using the VHDL models for the TTL ICs SN7474, SN7408 and SN7404. You are allowed two instances of SN7474 and, one instance of each of the other two ICs. VHDL models can be found in `~csci355/Lab8`.

Deliverable (D3): Electronic submission of source code (`make submit`).

Task: Map your VHDL model to a TTL-based physical design for the sequential system.

Deliverable (D4): IC logic schematic.

Task: Specify IC interconnections.

Deliverable (D5): One completed pin-out sheet (at least) for each IC employed in your physical design.

Task: In the laboratory, wire-up your physical design, verify its behaviour and sign-off on the design/implementation.

Deliverable (D6): A physical realization of the sequential system that behaves to specification. Details of the circuit-verification process. Student signature indicating that the circuit behaves as specified.

Task: Document any relevant results, explanations or comments.

Deliverable (D7): A section in your report entitled Results/Explanations/Comments in which you have detailed any relevant results, explanations or comments.

NOTES