

Experiment 8

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

$$00_2 \ 01_2 \ 11_2 \ 10_2 \ 00_2 \ 01_2 \ \dots$$

The counter accepts two synchronous control signals to set and clear the count. s follows:

SET	CLR	Action
0	0	Count up (advance from current code word to its successor code word)
0	1	Clear count to 00
1	0	Set count 11
1	1	Illegal input

Design your synchronous circuit as a Moore machine using JK flip flops with asynchronous preset and clear. Each state is assigned a Grey code word and the initial state is 00.

Task (T1): Develop the machine's state diagram and state table.

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

Task (T2): 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 (T3): Develop a structural Verilog model of the sequential machine using the Verilog models for the TTL ICs SN7476, SN7408 SN7432 and SN7404. You are allowed one instance of each IC.

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

Task (T4): Map your Verilog model to a TTL-based physical design for the sequential system.

Deliverable (D4): IC logic schematic.

Task (T5): Specify IC interconnections.

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

Task (T6): 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 (T7): 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