Middle East Technical University - Department of Computer Engineering

CENG 232

Logic Design

Spring 2022-2023

Lab Quiz 1

Quiz date: Saturday, April 8, 2023, 13:30
Duration 60 minutes

Logisim Part

You are expected to draw the circuits using the Logisim (CENG version) tool. For each question, you need to find minimized function F in the form of the sum of products and draw the circuit of that function. **You may ask your questions using the chatbox of Zoom.**
The Logisim part consists of 2 questions. Labeling conventions are provided in each question section.

- Please implement each question in a different circ file.
- The circ file of the "Encoder" question should be named as **question1.circ**.
- The circ file of the "7-Segment Display" question should be named as **question2.circ**.

IC Pool

Only the following logic gates should be employed for both questions.

- 74LS04 (Inverter)
- 74LS08 (AND)
- 74LS32 (OR)

Q1) Encoder

Encoder circuitry outputs the binary representation of the activated input hence it yields the reverse function of the Decoder circuitry. You are expected to implement a 4x2 encoder. This encoder consists of 4 inputs (I3, I2, I1, I0) and 2 outputs (O1, O0). At a given time only one of the inputs will be activated (1).

Input				Output	
I3	I2	I1	I0	O1	O0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1

Labelling Specifications

- Your input pins should be labelled as I3, I2, I1, I0.
- Your output pins should be labeled as **O1**, **O0**.
- Label properties are case-sensitive. **Please be very careful at naming the labels correctly.**
- You will receive grade **penalty** unless labeling is done properly.

Q2) 7-Segment Display

Based on the seven-segment decoder shown in Figure 1, you are expected to implement only the output "e" for the decoder with (A, B, C, D) inputs.

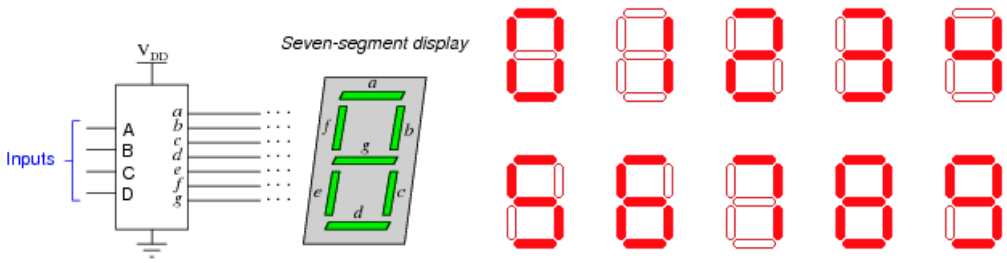

Figure 1: Seven-segment display decoder with every possible numeral output.

A is the most significant bit input, B is the second most significant bit input, C is the third most significant bit input and D is the least significant bit input for the decoder. In other words:

- When A=0, B=0, C=0, D=0, 0 is displayed.
- When A=0, B=0, C=0, D=1, 1 is displayed.
- When A=0, B=0, C=1, D=0, 2 is displayed.
- When A=0, B=0, C=1, D=1, 3 is displayed.
- When A=0, B=1, C=0, D=0, 4 is displayed.
- When A=0, B=1, C=0, D=1, 5 is displayed.
- When A=0, B=1, C=1, D=0, 7 is displayed.
- When A=1, B=0, C=0, D=0, 8 is displayed.
- When A=1, B=0, C=0, D=1, 9 is displayed.

Labeling Specifications

- The input pins should be labeled as **A**, **B**, **C**, and **D**.
- The output pin should be labeled as **e**.
- Label properties are case-sensitive. **Please be very careful at naming the labels correctly.**
- You will receive grade **penalty** unless labeling is done properly.

Cheating Policy

All the work should be individual and there is a zero-tolerance policy for cheating. See the course website for further information about the cheating policy.

References

CENG Logisim Version.