

German-Jordanian University
School of Electrical Engineering and Information Technology
Department of Computer Engineering

CE2120-Digital Systems Lab

Lab 6

I. Objectives

The objective of this lab is to introduce students to gate-level minimization using K-map, and to utilize it in designing combinational logic circuits.

II. Preparations

1. Use Karnaugh maps to simplify the following functions in sum of product form:
 - a. $F(X,Y,Z) = \sum m(0,1,4,7)$
 - b. $G(X,Y,Z,W) = \sum m(1,2,3,5,13,15) + \sum d(0,6,8)$
2. Design a combinational circuit with 3 inputs, x, y, and z, and three outputs, A, B, and C. when the binary input is 3, 4, 5, 6, or 7, the binary output is one less than the input. When the binary input is 0,1, or 2, the binary output is two greater than the input.
 - a. Provide a truth table of the combinational circuit.
 - b. Use Karnaugh maps to simplify each output.
 - c. Draw the logic diagram to implement this circuit.
3. Design a combinational circuit that produces the binary sum of two 2-bit numbers, x_1x_0 , and y_1y_0 . The outputs are C, S_1 , and S_0 .
 - a. Provide a truth table of the combinational circuit.
 - b. Use Karnaugh maps to simplify each output.
 - c. Draw the logic diagram to implement this circuit.
4. Design a combinational circuit that converts a decimal digit from the 2-4-2-1 code to the 8-4-2-1 code.
 - a. Provide a truth table of the combinational circuit.
 - b. Use Karnaugh maps to simplify each output.
 - c. Draw the logic diagram to implement this circuit.

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III. Lab work

In this experiment:

- a. Setup the circuit in 2 on your breadboard and use LEDs to check the logic level of the outputs. Also, check the operation of the circuit using the obtained truth table.
- b. Setup the circuit in 3 on your breadboard and use LEDs to check the logic level of the outputs. Also, check the operation of the circuit using the obtained truth table.
- c. Setup the circuit in 4 on your breadboard and use LEDs to check the logic level of the outputs. Also, check the operation of the circuit using the obtained truth table.