



North South University

Department of Electrical & Computer Engineering

Lab Report

Experiment No:	05
Experiment Title:	BCD to seven-segment decoder
Course Code:	CSE231L
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Lab Group #:	02
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Objectives

The primary objective of this experiment is to design and analyze the functionality of a BCD to seven-segment decoder. This combinational circuit decoder converts a binary-coded decimal (BCD) input into a corresponding seven-segment display output, representing decimal numbers.

Equipment List

- Trainer board
- IC 7447 (BCD to seven-segment decoder IC)
- Resistors
- Seven-segment display
- Wires for connections

Theory

A BCD to seven-segment decoder is a combinational circuit that converts a 4-bit binary-coded decimal (BCD) input into a seven-segment display output. The seven-segment display visually represents decimal digits using seven individual segments labeled **a, b, c, d, e, f, and g**. Each segment is illuminated by applying a logic high to its respective input, forming numbers from 0 to 9.

The seven-segment display contains seven LEDs arranged in a specific pattern. The segments are activated according to the input from the BCD, where each combination of the BCD input (DCBA) corresponds to a particular decimal number. The **IC 7447** decodes the BCD and controls which segments are illuminated.

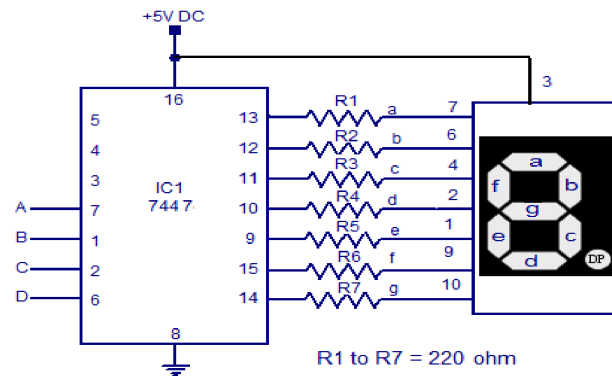
It works by giving a BCD Input of 4-bit, representing values between 0 and 9 in binary form. Then, the decoder converts the BCD input to appropriate control signals for the segments. If a segment needs to be illuminated, the corresponding output will be set to logic low. Each number from 0 to 9 has a unique combination of segments that needs to be illuminated.

The **IC 7447** decoder follows a logic high convention to illuminate the segments. The following pin configuration applies to the IC:

- Pin 1,2,6,7: Inputs for BCD (A, B, C, D)
- Pins 9-15: Outputs to the seven-segment display (a, b, c, d, e, f, g)
- Pin 16: Vcc (Power supply)
- Pin 8: Ground

The truth table directly correlates the BCD input to the display segments will be illuminated.

Circuit Diagram



Data Table & Equation

Decimal	Inputs				Outputs						
	D	C	B	A	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	1	1	0	0	0	0
2	0	0	1	0	1	1	0	1	1	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	1	0	1	1	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	1	0	1	1

Discussion

The purpose behind performing this experiment is to design and implement a combinational logic circuit that uses BCD as input, in order to illuminate a seven-segment display output. Before implementing the circuit, the circuit was simulated first in Logisim, and the schematic was followed to implement the circuit.

Due to the relative simplicity of the circuit, no complexity was faced in implementing and managing the wiring of the circuit. Therefore, careful consideration was applied during establishing the pin-connections between the IC and the seven-segment display, so that no physical damage was done to the IC, due to the wrong connections.

This lab experiment provided an exciting opportunity for all of us. We have always seen the use of LED lights on the lift floor indicator or shop banners, and creating this by ourselves has been fascinating. In conclusion, we would like to acknowledge the supervision of our lab instructor and the persisting effort by our group members, without which this lab experiment would not have been completed successfully.

Logisim Simulation

