# JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY



# COMPUTER ORGANIZATION AND ARCHITECTURE LAB PROJECT REPORT

## 18B17CI574

**SUBMITTED BY:**

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# BCD to 7-Segment Conversion

## 1. Objective

The objective of this project is to design and implement a BCD (Binary-Coded Decimal) to 7-segment converter using Logisim. This project demonstrates the principles of digital logic design and highlights the practical applications of BCD-to-7-segment conversion in digital systems.

## 2. Theory

### BCD

Binary-Coded Decimal (BCD) is a binary encoding of decimal numbers where each decimal digit is represented by its own binary sequence. For example, the decimal number 9 is represented as 1001 in BCD. This encoding is commonly used in systems where numerical data must be displayed in human-readable form, such as calculators and digital clocks.

### 7-Segment Display

A 7-segment display is an electronic display device used to represent decimal numbers. It consists of seven LEDs (segments) arranged in the shape of the digit '8'. Each segment

| Decimal Digit | Input lines | | | | Output lines | | | | | | | Display pattern |
|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| | A | B | C | D | 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 | |

can be lit individually to display numbers from 0 to 9. This display is widely used in digital clocks, calculators, and other embedded systems.
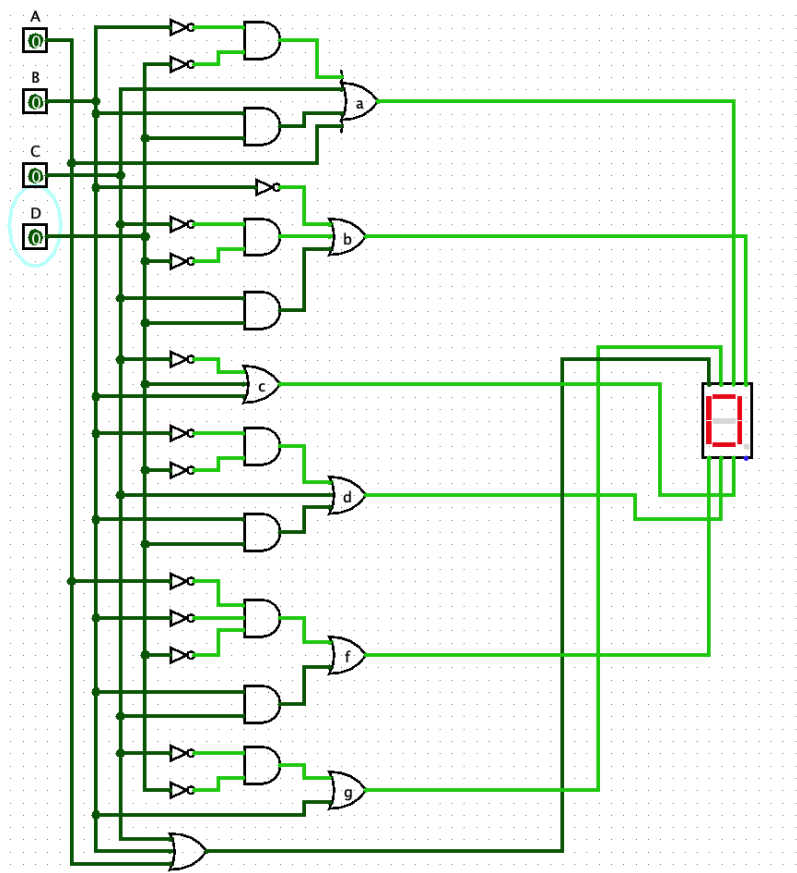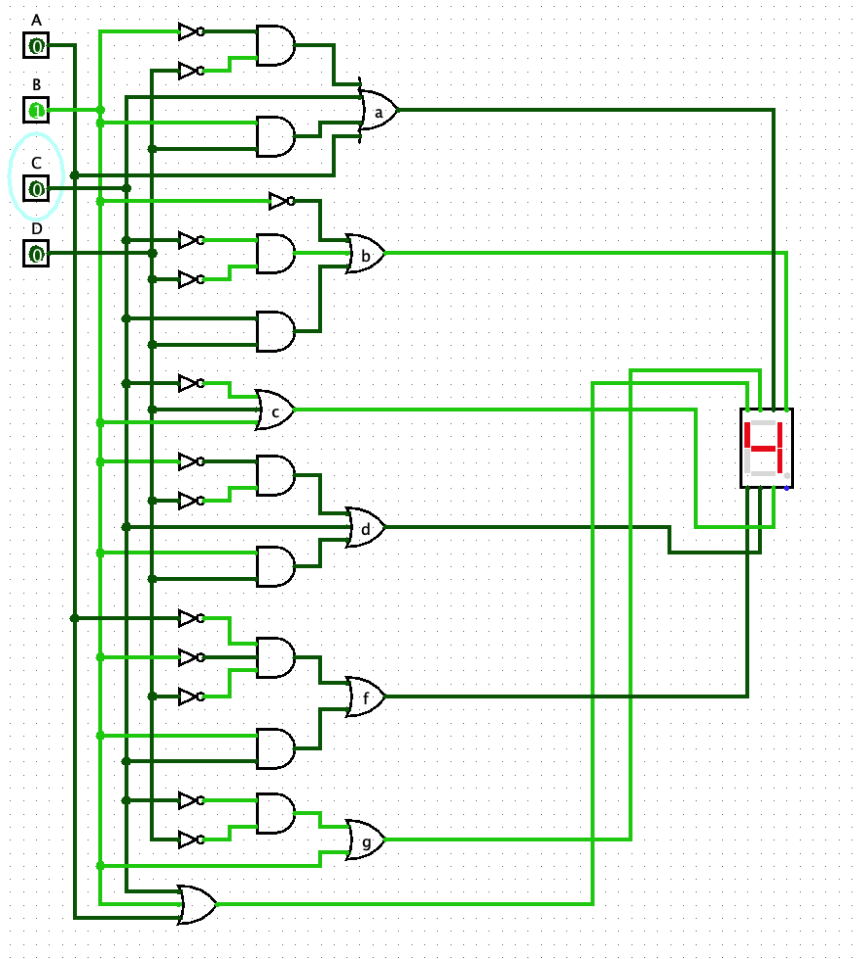
**BCD to 7-Segment Conversion**

The BCD to 7-segment conversion involves mapping the 4-bit BCD input to the corresponding 7-segment output. Each segment of the display (a, b, c, d, e, f, g) is controlled by a combinational logic circuit. The circuit is designed using a truth table that defines the segments to be activated for each decimal digit.

## 3. Circuit Diagram

The circuit diagram for the BCD-to-7-segment converter demonstrates the logic required to drive the display.

In BCD to 7 segment LED, the 7 segment LED can be thought of as floors indicator in elevators. All 7 segments are named as a,b,c,d,e.f,g, which are marked as 0 or 1 for particular 0-9 decimals. e.g., for 7 a,b,c are turned on because a is for upper segment, b is for upper right, and c is for bottom right, if these are turned on you would see a 7 on a LED.

## 4. Importance and Applications

**Importance of BCD to 7-Segment Converter**
The BCD to 7-segment converter is a critical component in digital systems where human-readable numeric data needs to be displayed. It simplifies the process of converting machine-readable binary data into a format that is easily interpreted by humans. This is particularly important in embedded systems, consumer electronics, and industrial applications.

**Applications of BCD to 7-Segment Converter**
- Digital clocks and watches
- Calculators
- Digital meters (voltage, current, etc.)
- Embedded systems
- Automotive dashboards
- Industrial control panels

## 5. Conclusion

In conclusion, the BCD to 7-segment converter is an essential digital logic component that bridges the gap between machine-readable data and human-readable displays. Its widespread applications in everyday devices such as calculators, clocks, and meters highlight its importance in modern electronics and embedded systems.