



Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

Department of Electrical & Computer Engineering

LAB REPORT

- ❖ Course title : Digital Techniques sessional
- ❖ Course Code : ECE-2112
- ❖ Date of submission : 10/02/2025

Submitted By:	Submitted To:
Name : Sanumong Marma	Md. Omaer Faruq Goni
Roll : 2210061	Assistant Professor
Reg no. : 1115	Department of ECE,
Series : 22	RUET
Department of ECE, RUET	

Experiment no.: 04

Name of the Experiment: Application of BCD to 7 segment display decoder.

Theory: The 7-segment display, also written as “seven segment display”, consists of seven LEDs (hence its name) arranged in a rectangular fashion as shown. Each of the seven LEDs is called a segment because when illuminated the segment forms part of a numerical digit (both Decimal and Hex) to be displayed.

An additional 8th LED is sometimes used within the same package thus allowing the indication of a decimal point, (DP) when two or more 7-segment displays are connected to display numbers greater than ten.

Each one of the seven LEDs in the display is given a positional segment with one of its connection pins being brought straight out of the rectangular plastic package. These individually LED pins are labelled from a through to g representing each individual LED. The other LED pins are connected and wired to form a common pin.

So, by forward biasing the appropriate pins of the LED segments in a particular order, some segments will be light, and others will be dark allowing the desired character pattern of the number to be generated on the display. This then allows us to display each of the ten decimal digits 0 through to 9 on the same 7-segment display.

Truth Table:

DIGITS	INPUT A	INPUT B	INPUT C	INPUT D	OUTPUT a	OUTPUT b	OUTPUT c	OUTPUT d	OUTPUT e	OUTPUT f	OUTPUT 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

Circuit Diagram:

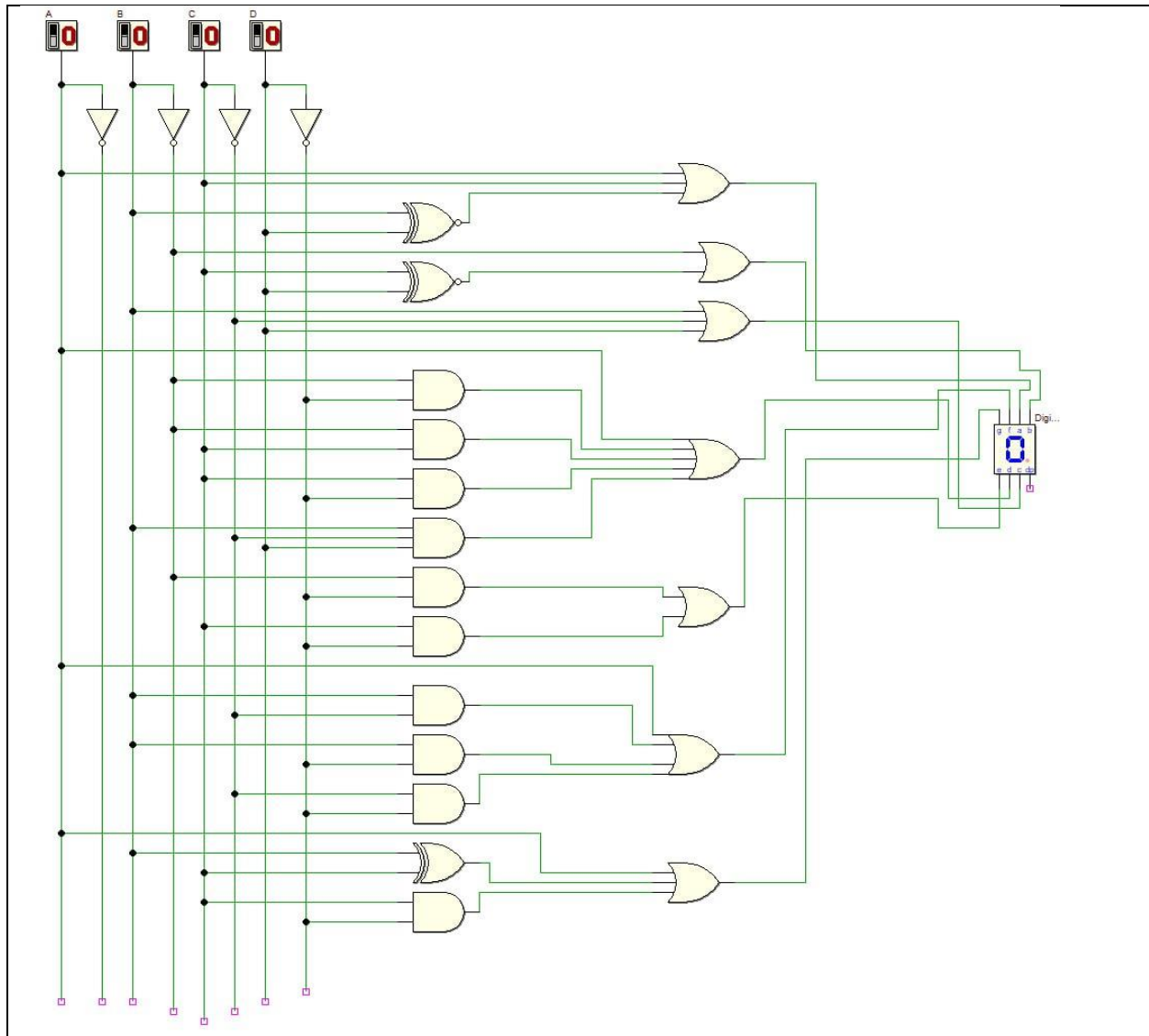


Fig. BCD to 7-Segment Display Decoder

Verilog Code:

```
1  module BCD7Segment(  
2      input [3:0] bcd, // 4-bit BCD input  
3      output reg [6:0] seg // 7-segment display output (abcdefg)  
4  );  
5  
6      always @(*) begin  
7          case (bcd)  
8              4'b0000: seg = 7'b0000001; // 0  
9              4'b0001: seg = 7'b1001111; // 1  
10             4'b0010: seg = 7'b0010010; // 2  
11             4'b0011: seg = 7'b0000110; // 3  
12             4'b0100: seg = 7'b1001100; // 4  
13             4'b0101: seg = 7'b0100100; // 5  
14             4'b0110: seg = 7'b0100000; // 6  
15             4'b0111: seg = 7'b0001111; // 7  
16             4'b1000: seg = 7'b0000000; // 8  
17             4'b1001: seg = 7'b0000100; // 9  
18             default: seg = 7'b1111111; // Blank display for invalid  
19             BCD (10-15)  
20         endcase  
21     end  
22  
23 endmodule  
24
```

Verilog TestBench Code:

```
1      module TestBench;
2          reg [3:0] bcd;
3          wire [6:0] seg;
4
5          BCD7Segment uut ( .bcd(bcd), .seg(seg) );
6
7          initial begin
8              $monitor("BCD: %b, Segment Output: %b",
9                  bcd, seg);
10
11              bcd = 4'b0000; #10; // 0
12              bcd = 4'b0001; #10; // 1
13              bcd = 4'b0010; #10; // 2
14              bcd = 4'b0011; #10; // 3
15              bcd = 4'b0100; #10; // 4
16              bcd = 4'b0101; #10; // 5
17              bcd = 4'b0110; #10; // 6
18              bcd = 4'b0111; #10; // 7
19              bcd = 4'b1000; #10; // 8
20              bcd = 4'b1001; #10; // 9
21              bcd = 4'b1010; #10; // Invalid (should be
22              blank)
23              $stop;
24          end
25      endmodule
26
```

Output:

BCD: 0000, Segment Output: 0000001 // Display 0
BCD: 0001, Segment Output: 1001111 // Display 1
BCD: 0010, Segment Output: 0010010 // Display 2
BCD: 0011, Segment Output: 0000110 // Display 3
BCD: 0100, Segment Output: 1001100 // Display 4
BCD: 0101, Segment Output: 0100100 // Display 5
BCD: 0110, Segment Output: 0100000 // Display 6
BCD: 0111, Segment Output: 0001111 // Display 7
BCD: 1000, Segment Output: 0000000 // Display 8
BCD: 1001, Segment Output: 0000100 // Display 9
BCD: 1010, Segment Output: 1111111 // Blank

Discussion: The display consists of seven segments, each of which is a “6-sided box” made of two thin pieces of metal, typically aluminum. Additionally, the parts are positioned at a right angle. A 7-segment display’s individual numerals are built of light-emitting diodes. By turning on specific LEDs it can generate numbers on display.