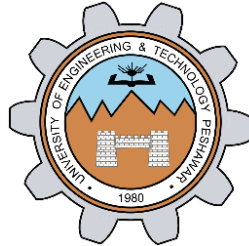


# **DIGITAL SYSTEM DESIGN LAB**

**LAB #03**



**Spring 2021**

**CSE308L DSD LAB**

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Class Section: **B**

“On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work.”

Student Signature: \_\_\_\_\_

Submitted to:

**Engr. Madiha Sher**

Wednesday, May 5, 2021

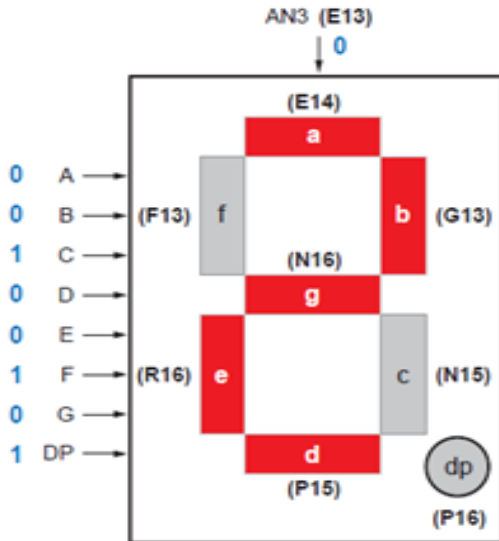
**Department of Computer Systems Engineering**  
**University of Engineering and Technology, Peshawar**

## Objectives:

This lab will enable students to:

- Learn top down and bottom up design methodologies
- Use seven segment display available on the S3board
- Data flow level modeling

## Task # 01: BCD to Seven Segment Decoder.



## Problem Analysis:

### Truth Table:

W	X	Y	Z	dp	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	0	0	1	1	0	0	0	0
0	0	1	0	0	1	1	0	1	1	0	1
0	0	1	1	0	1	1	1	1	0	0	1
0	1	0	0	0	0	1	1	0	0	1	1
0	1	0	1	0	1	0	1	1	0	1	1
0	1	1	0	0	1	0	1	1	1	1	1
0	1	1	1	0	1	1	1	0	0	0	0
1	0	0	0	0	1	1	1	1	1	1	1
1	0	0	1	0	1	1	1	1	0	1	1
1	0	1	0	1	0	0	0	0	0	0	0
1	0	1	1	1	0	0	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0	0
1	1	0	1	1	0	0	0	0	0	0	0
1	1	1	0	1	0	0	0	0	0	0	0
1	1	1	1	1	0	0	0	0	0	0	0

**Code:****Module:**

```
module BCDto7S(dp,Segment,BCD);
    input [3:0] BCD;
    output [6:0] Segment;
    output dp;

    assign {dp,Segment} = (BCD==4'b0000)?8'b01111110:
                          (BCD==4'b0001)?8'b00110000:
                          (BCD==4'b0010)?8'b01101101:
                          (BCD==4'b0011)?8'b01111001:
                          (BCD==4'b0100)?8'b00110011:
                          (BCD==4'b0101)?8'b01011011:
                          (BCD==4'b0110)?8'b01011111:
                          (BCD==4'b0111)?8'b01110000:
                          (BCD==4'b1000)?8'b01111111:
                          (BCD==4'b1001)?8'b01111011:8'b10000000;

endmodule
```

**Test Bench:**

```
module testBCDto7S;
    reg [3:0] BCD;
    wire [6:0] Segment;
    wire dp;

    BCDto7S m1(dp,Segment,BCD);

    initial
    begin
        $display("W X Y Z dp a b c d e f g");
        $monitor("%b %b %b %b %b %b %b %b %b %b %b %b",
BCD[3],BCD[2],BCD[1],BCD[0],dp,Segment[6],Segment[5],Segment[4],Segment[3],Segment[2],Segment[1],Segment[0]);
        BCD = 4'b0000;
        #5
        BCD = 4'b0001;
        #5
        BCD = 4'b0010;
        #5
        BCD = 4'b0011;
        #5
        BCD = 4'b0100;
        #5
        BCD = 4'b0101;
        #5
        BCD = 4'b0110;
```



At 40ns:

<div><div></div><div>/testBCDto7S/BCD</div></div>	1000	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111		
<div><div></div><div>/testBCDto7S/Segm...</div></div>	11111111											00000000							
<div><div></div><div>/testBCDto7S/dp</div></div>	0																		

At 50ns:

<div><div></div><div>/testBCDto7S/BCD</div></div>	1010	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111		
<div><div></div><div>/testBCDto7S/Segm...</div></div>	00000000											00000000							
<div><div></div><div>/testBCDto7S/dp</div></div>	1																		

At 65ns:

<div><div></div><div>/testBCDto7S/BCD</div></div>	1101	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111		
<div><div></div><div>/testBCDto7S/Segm...</div></div>	00000000											00000000							
<div><div></div><div>/testBCDto7S/dp</div></div>	1																		

Dataflow:

