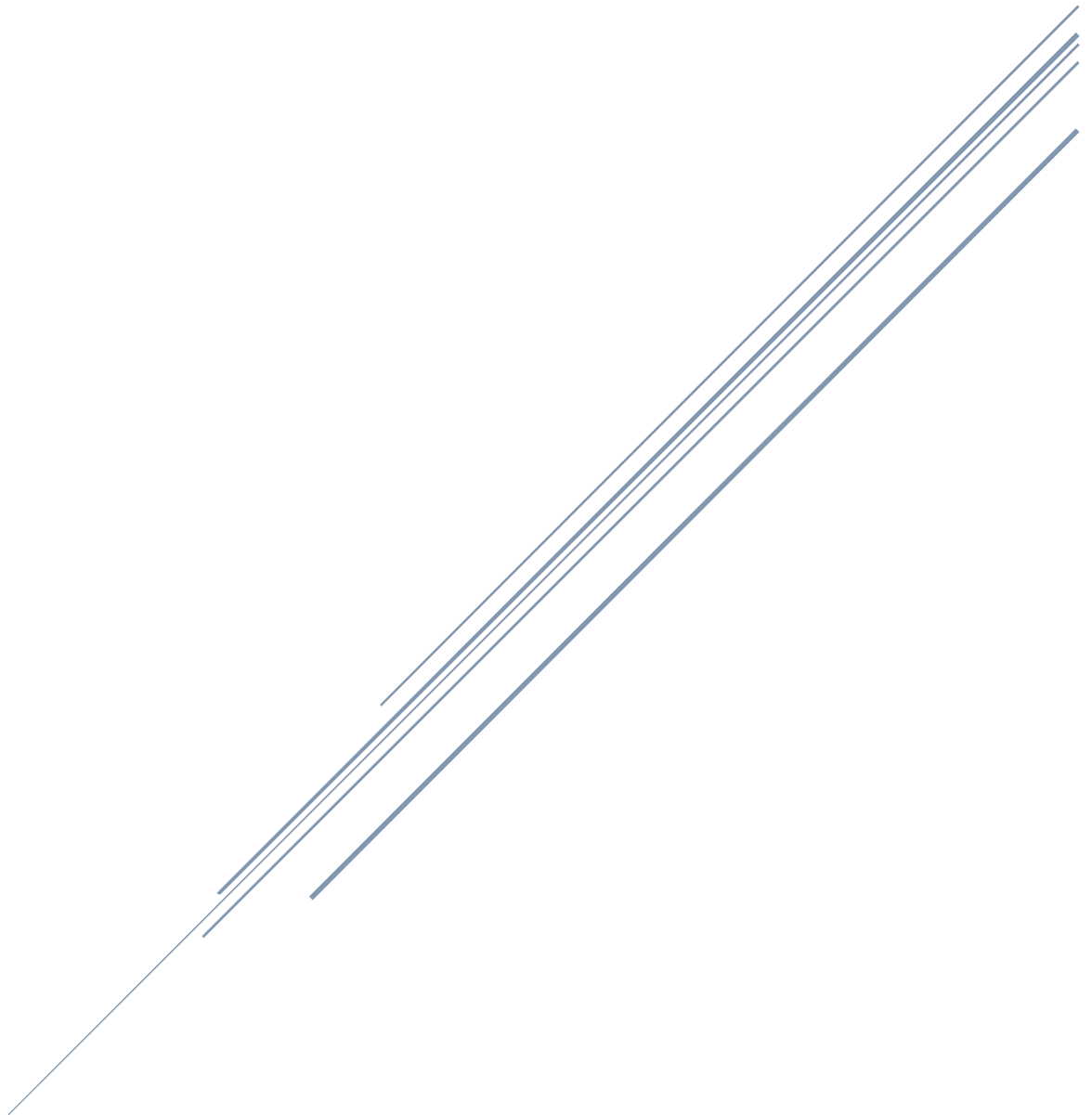




## BCD to decimal seven segment

Digital Logic (North South University)

# SEVEN SEGMENT DISPLAY



## Abstract

An ABCD to seven segment decoder is a combinational circuit that converts a decimal digit in BCD to an appropriate code for the selection of segments in an indicator used to display decimal digit in a familiar form. The seven outputs of the decoder ( a, b, c, d, e, f, g ) select the corresponding segments in the display, as shown in figure (a). The numeric display chosen to represent the decimal digit is shown in figure (b).

Each element (a, b, c, d, e, f, g ) of the seven segment display is turned on when a logic low is applied to its corresponding input pin if we are using common anode display.

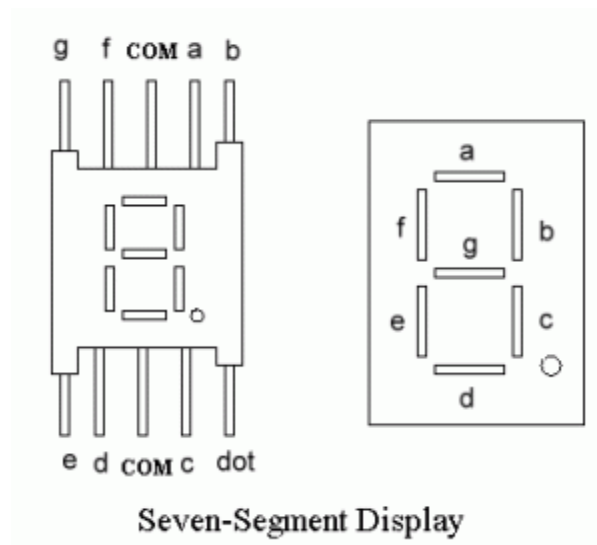
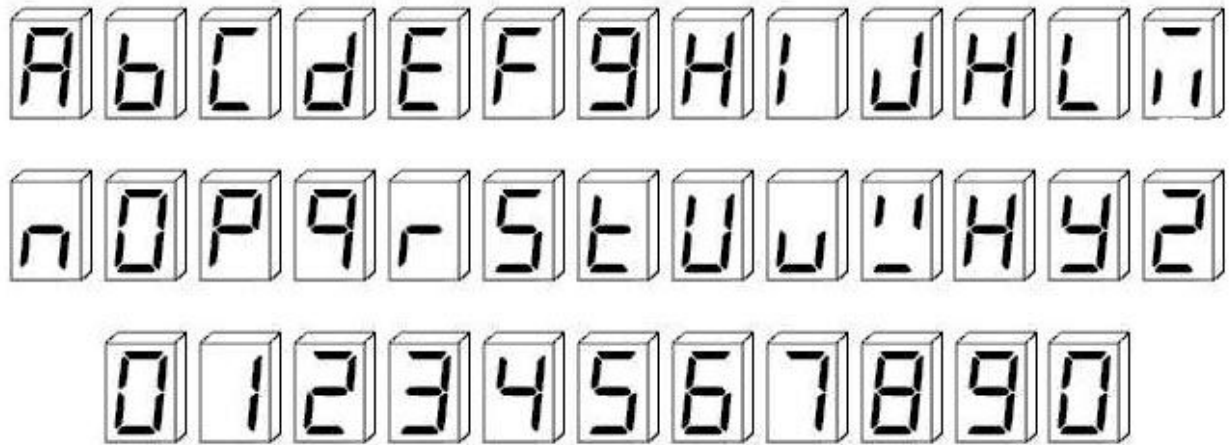


Figure (a) Seven- Segment Display



Figure (b) Display of decimal digits with a 7- segment device

It can even be used to display English letters. Some letters are very difficult to display.



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# Introduction

Contributing Author names

This project is about BCD to seven segment decoder. In this project, we are going to display some letters with the help of seven segment device.

Most often seven-segment displays are used to display the digits in digital watches, calculators, clocks, measuring instruments and digital counters, etc. Generally, LCD and LED segments provide the display output of numerical numbers and characters.

However to display the characters and numbers (in order to produce the decimal readout), seven-segment displays are most commonly used. Mostly these displays are driven by the output stages of digital ICs (to which the visual indication of the output stages has to be performed) such as latches and decade counters, etc.

But these outputs are in the form of 4-bit binary coded decimal (BCD), and not suitable for directly driving the [seven-segment displays](#).

A display decoder is used to convert a BCD or a binary code into a 7 segment code. It generally has 4 input lines and 7 output lines. Here we design a simple display decoder circuit using logic gates.

Even though commercial BCD to 7 segment decoders are available, designing a display decoder using logic gates may prove to be beneficial from economical as well as knowledge point of view.

## Background

Contributing Author names

The basic idea involves driving a common anode 7-segment LED display using two combinational logic circuit. First one using BCD to seven segment decode. And the other one using basic gate to display English letters which does not look like numbers. The first logic circuit is designed with 4 inputs and 7 outputs, and second one is designed with 3 inputs and 7 outputs; each representing an input to the display IC. Using Karnough's map, logic circuitry for each input to the display is designed.

# Design Methodology



### BCD to decimal seven segment

D	C	B	A	a	b	c	d	e	f	g
0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	0	1	1	0	0	0	0
0	0	1	0	1	1	0	1	1	0	1
0	0	1	1	1	1	1	1	0	0	1
0	1	0	0	0	1	1	0	0	1	1
0	1	0	1	0	0	1	1	0	1	1
0	1	1	0	1	0	1	1	1	1	1
0	1	1	1	1	1	1	0	0	0	0
1	0	0	0	1	1	1	1	1	1	1
1	0	0	1	1	1	1	1	0	1	1

### BCD to seven segment K-Map:

	00	01	11	10
00	1	0	1	1
01	0	1	1	1
11	x	x	x	x
10	1	1	x	x

$$a = D + B + C'A' + CA$$

	00	01	11	10
00	1	1	1	1
01	1	0	1	0
11	x	x	x	x
10	1	1	x	x

$$b = C' + B'A' + BA$$

	00	01	11	10
00	1	1	1	0
01	1	1	1	1
11	x	x	x	x
10	1	1	x	x

$$c = B' + A + C$$

	00	01	11	10
00	1	0	1	1
01	0	1	0	1
11	x	x	x	x
10	1	1	x	x

$$d = D + C'A' + BA' + C'B$$

	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	x	x	x	x
10	1	0	x	x

$$E = C'A' + BA'$$

	00	01	11	10
00	1	0	0	0
01	1	1	0	1
11	x	x	x	x
10	1	1	x	x

$$f = D + B'A' + CA' + CB'$$

	00	01	11	10
00	1	1	1	1
01	1	0	1	0
11	x	x	x	x
10	1	1	x	x

$$g = D + CB' + C'B + BA'$$

Custom seven segment:

A	B	C	a	b	c	d	e	f	g
0	0	0	0	0	0	1	0	0	0
0	0	1	1	1	0	0	0	0	0
0	1	0	0	1	1	0	0	0	1
0	1	1	1	0	0	0	0	1	0
1	0	0	0	1	1	0	0	0	0
1	0	1	0	1	1	1	0	0	0
1	1	0	0	1	0	0	0	0	1
1	1	1	1	0	0	1	0	0	0

Custom seven segment K map:

	00	01	11	10
0	0	1	1	0
1	0	0	1	0

$$a = A'C + BC$$

	00	01	11	10
0	0	1	0	1
1	1	1	0	1

$$b = AB' + B'C + BC'$$

	00	01	11	10
0	0	0	0	1
1	1	1	0	0

$$c = AB' + A'C'B$$

	00	01	11	10
0	1	0	0	0
1	0	1	1	0

$$d = AC + A'C'B'$$

	00	01	11	10
0	0	0	0	0
1	0	0	0	0

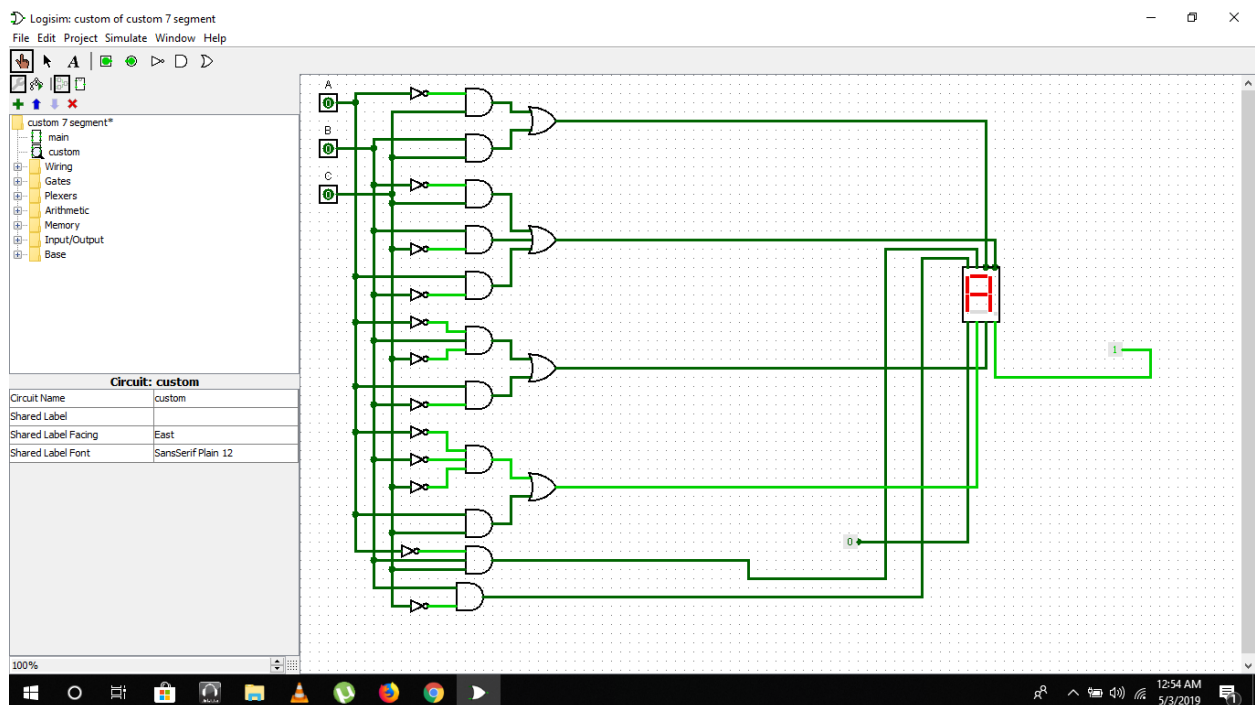
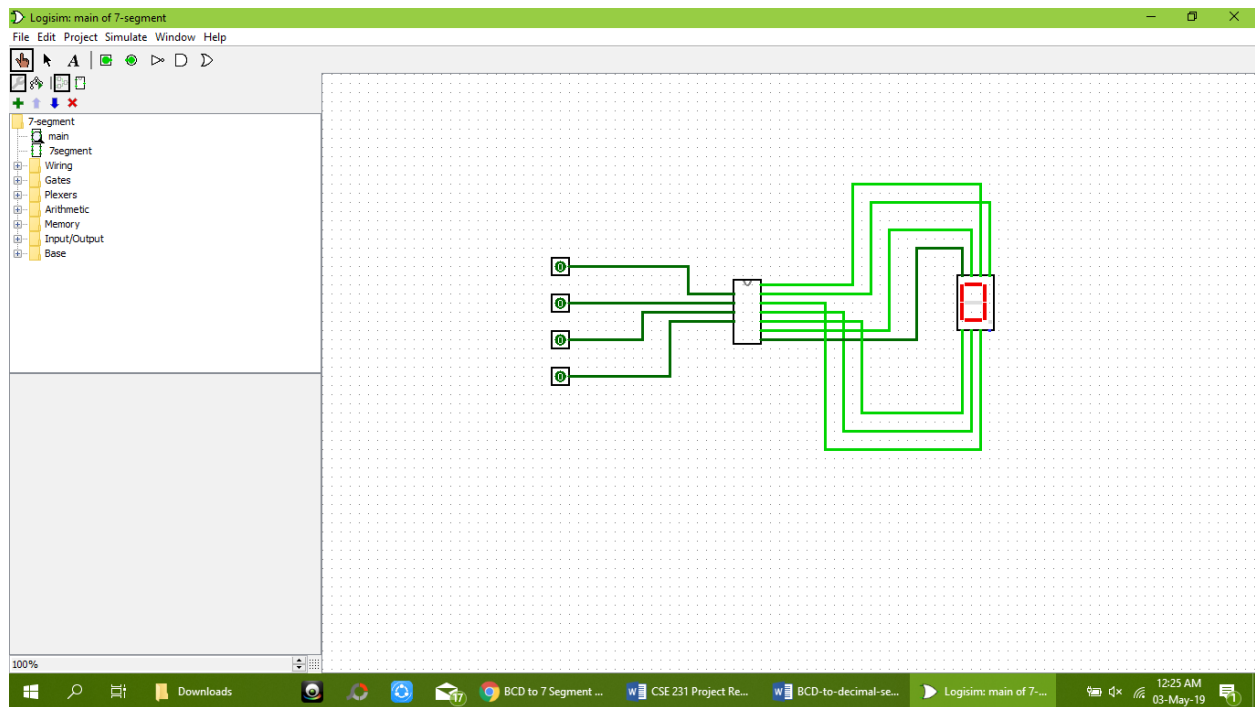
$e = 0$

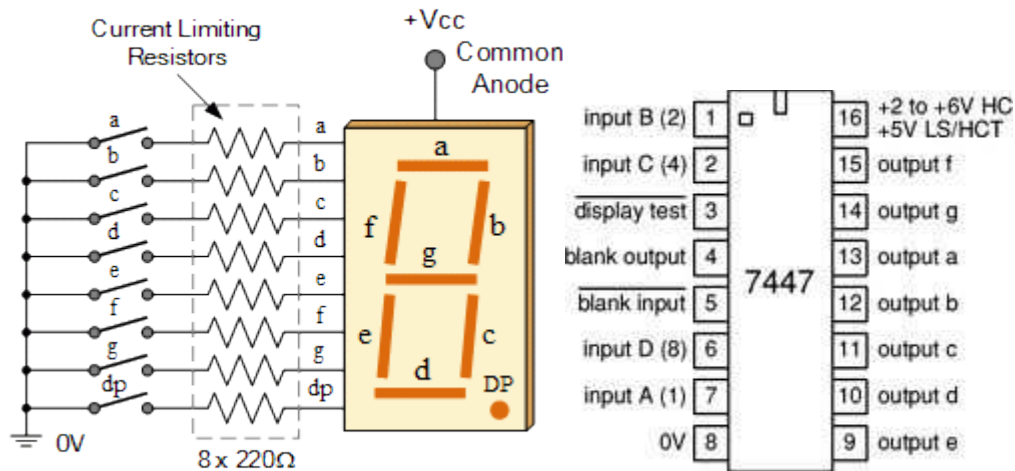
	00	01	11	10
0	0	0	1	0
1	0	0	0	0

$f = A'BC$

	00	01	11	10
0	0	0	0	1
1	0	0	0	1

$g = BC'$





## Results & Discussion

Contributing Author names

After implementing all of the above works, we finally completed the project. We faced many problems while doing the project. The wires were not working properly, the display was not working. But we changed them and finished our project perfectly.

## Conclusion

Contributing Author names

The designing of BCD to seven segment display decoder circuit mainly involves four steps namely analysis, truth table design, K-map and designing a combinational logic circuit using logic gates from that truth table.

The first step of this circuit design is an analysis of the common anode seven segment display. This display can be constructed with seven LEDs in the form of H. A truth table of this circuit can be designed by the inputs combinations for every decimal digit. For instance, decimal number '1' would control a blend of b & c.

The second step is the truth table design by listing [the display](#) input signals-7, equivalent four-digit binary numbers as well as decimal number.

The designing of the truth table for the decoder mainly depends on the kind of display. For a common anode display, the decoder output must be low in order to blink the segment.



## References

**There are no sources in the current document**

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