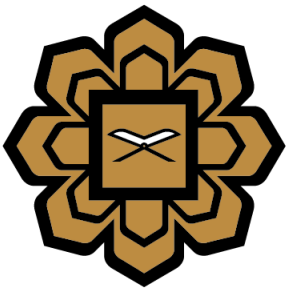


الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
يونيۏرسيتي إسلام انتارابغسا ملايسيا
Garden of Knowledge and Virtue

MCTE 2332
SECTION 1

GROUP MEMBERS:

BASONDOWAH HUSSEIN HASAN
(1723465)

7 Segment Displays

SEM 1 20/21

DEPARTMENT OF MECHATRONICS

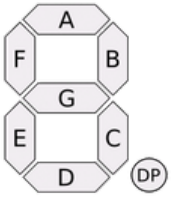
Introduction

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 an economical as well as knowledge point of view.



Objective of the project

The following will detail the necessary requirements to implement a display into a circuit. This application note will also provide the basic functionality of a seven-segment display. In terms of hardware, it will show a better understanding of how the 7 segment works and where it is mostly used.

Explanation:

Before we start implementing we first need to check if it is a common anode or common cathode. If it is a common anode then the 3rd pin in both top and bottom are VCC. But if it is we should connect the 3rd pin in both top and bottom to ground.

Pins:

show top pins then bottom pins (Dot side is down).

1
2
3

	Pin1	Pin2	Pin3	Pin4	Pin5
Top:	g	f	vcc/GND	a	b
Bottom:	e	d	vcc/GND	c	dp

Truth Table:

Binary Inputs	Decoder Outputs	7 Segment Display Outputs
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 0 1	0 1 1 0 0 0 0	1
0 0 1 0	1 1 0 1 1 0 1	2
0 0 1 1	1 1 1 1 0 0 1	3
0 1 0 0	0 1 1 0 0 1 1	4
0 1 0 1	1 0 1 1 0 1 1	5
0 1 1 0	1 0 1 1 1 1 1	6
0 1 1 1	1 1 1 0 0 0 0	7
1 0 0 0	1 1 1 1 1 1 1	8
1 0 0 1	1 1 1 1 0 1 1	9

Quickgrid

DLD 7-segment Display Truth Table

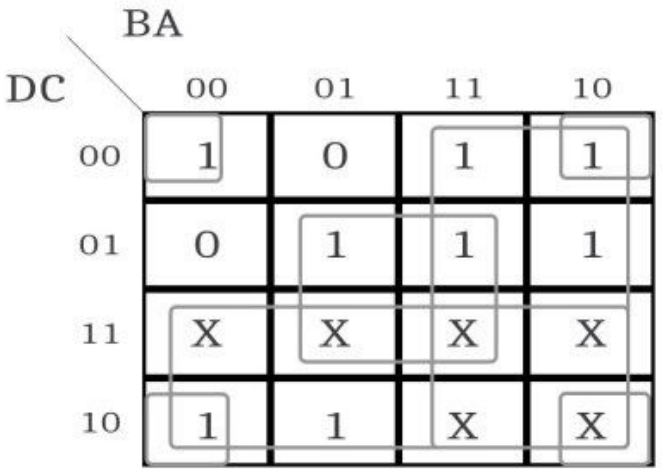
From here we can get minimized expressions for a, b, c, d, e, f, g using K-MAP. Here we only need value 0 through 9 rest don't care terms. Using those don’t care terms we will try to maximum ones first.

K-Map (Karnaugh map) for ‘a’:

We can follow a similar procedure for the rest. K map for ‘a’ can be created by taking the ‘a’ column from the table above and setting the value 0 / 1 to the corresponding location in the table. For example to display 0 (0000) ‘a’ is always 1. Similarly to display 1 ‘a’ is always 0. For value (10 – 16) we don’t care about them so they are used as don’t care terms in k maps.

K-Map:

a:

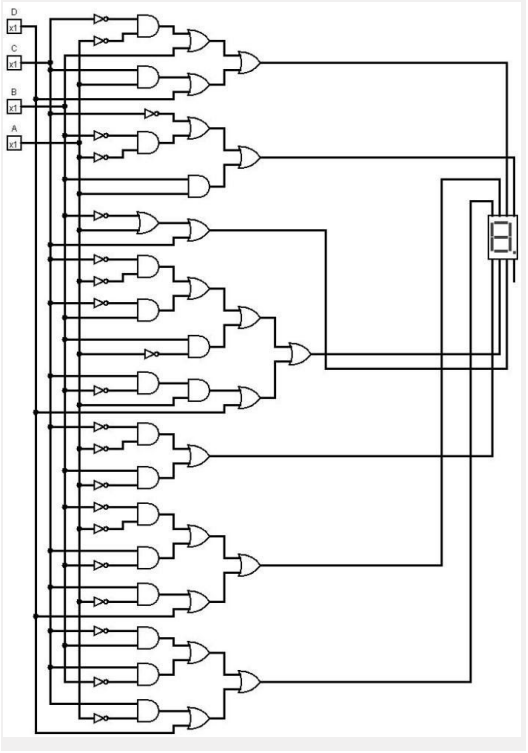


$$F_a(D,C,B,A) = D + B + CA + C'A'$$

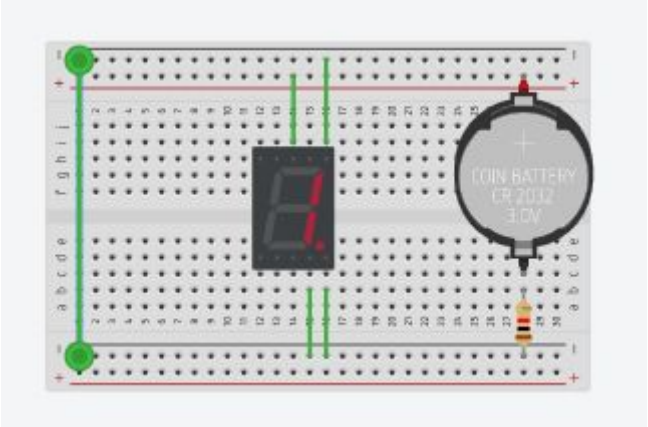
Quickgrid

k-map a output 7 segment

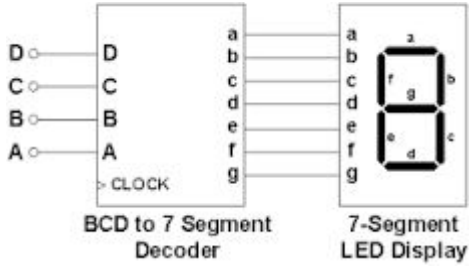
Logisim Diagram For Decoder Table:



TinkerCad.



Advantages of 7 segment



Advantages. Cost: The cost of the entire module of 7 segment display is very cheap as it only contains LEDs. Efficiency: LED displays in general are extremely efficient. Heat dissipation: The heat dissipated from these displays is very less and that increases the life of the devices.

Conclusion

This work provided a proper understanding of seven segment displays. A digital implementation to display letters and numbers on a single digit seven segment display has been implemented using logic expressions, logic gates, VHDL implementation and a physical implementation on a microcontroller. The application of this system is to a drug tablet bottling which displays the count number as well as the Vitamin type being bottled. The application was also extended to a multi-digit seven segment display in order to increase the count range. Further work will involve the design and implementation of a four-digit display

as a clock to give an indication and update of the hour, minute and second. The clock will have alarm capability so as to beep when the alarm goes off as well as set and reset inputs.