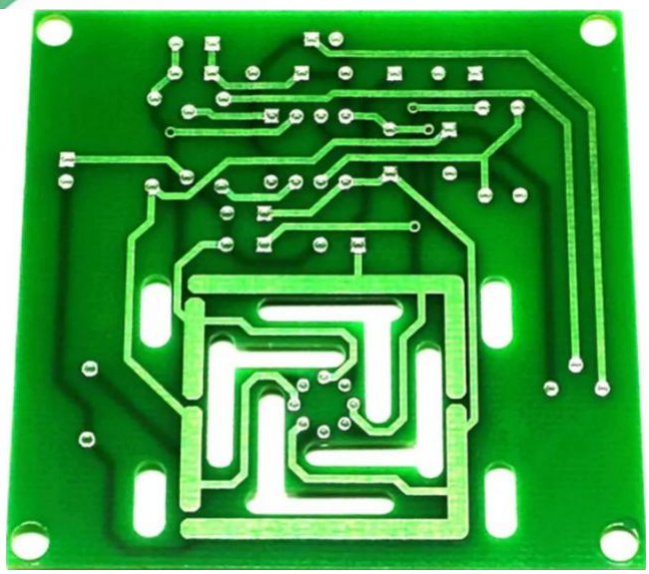
Bahan Ajar

Modul Praktikum

DESAIN DAN SIMULASI RANGKAIAN ELEKTRONIKA

Kode Matakuliah: SKO21425



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INSTITUT INFORMATIKA DAN BISNIS DARMAJAYA

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Modul 4

7 Segment Simulation

1. 7 Segment

A 7 Segment LED Display is a electronic device that contains an array of 8 individual LEDs. Each of the 8 segments that make up the display can be either be on the on state or the off state. Depending on which LEDs are lit determines the character which is displayed on the LED. The LED can be made to show a wide range of characters, including all numerical digits from 0-9.

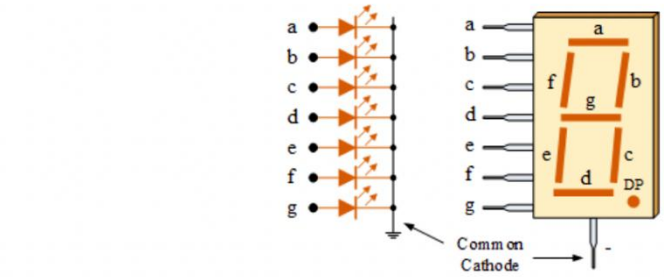
The versatility of a 7 segment display lies in the fact that it can be a numerical value indicator. LED displays are used in all types of products, including alarm clocks, scoreboards, and all other signs showing character output.

2. Types of 7 Segment Displays

The displays common pin is generally used to identify which type of 7-segment display it is. As each LED has two connecting pins, one called the “Anode” and the other called the “Cathode”, there are therefore two types of LED 7-segment display called: Common Cathode (CC) and Common Anode (CA). The difference between the two displays, as their name suggests, is that the common cathode has all the cathodes of the 7-segments connected directly together and the common anode has all the anodes of the 7-segments connected together and is illuminated as follows.

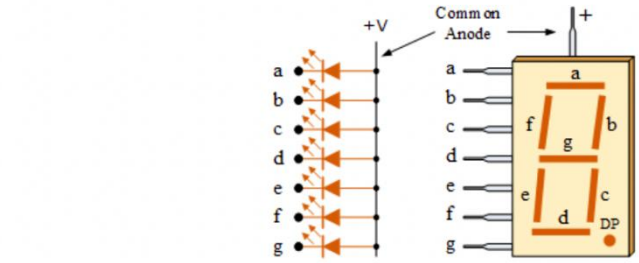
The Common Cathode (CC) – In the common cathode display, all the cathode connections of the LED segments are joined together to logic “0” or ground. The individual segments are illuminated by application of a “HIGH”, or logic “1” signal via a current limiting resistor to forward bias the individual Anode terminals (a-g).

Common Cathode 7-segment Display



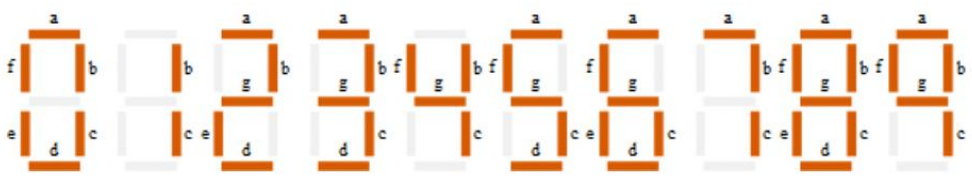
The Common Anode (CA) – In the common anode display, all the anode connections of the LED segments are joined together to logic “1”. The individual segments are illuminated by applying a ground, logic “0” or “LOW” signal via a suitable current limiting resistor to the Cathode of the particular segment (a-g).

Common Anode 7-segment Display



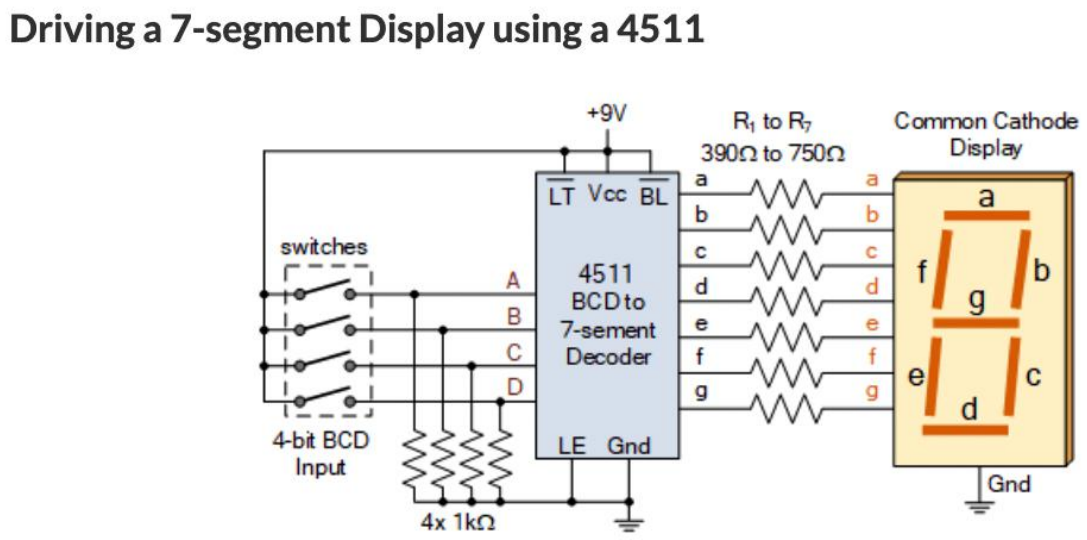
In general, common anode displays are more popular as many logic circuits can sink more current than they can source. Also note that a common cathode display is not a direct replacement in a circuit for a common anode display and vice versa, as it is the same as connecting the LEDs in reverse, and hence light emission will not take place. Depending upon the decimal digit to be displayed, the particular set of LEDs is forward biased. For instance, to display the numerical digit 0, we will need to light up six of the LED segments corresponding to a, b, c, d, e and f. Thus the various digits from 0 through 9 can be displayed using a 7-segment display as shown.

7-Segment Display Segments for all Numbers.



3. Driving a 7-segment Display using a 4511

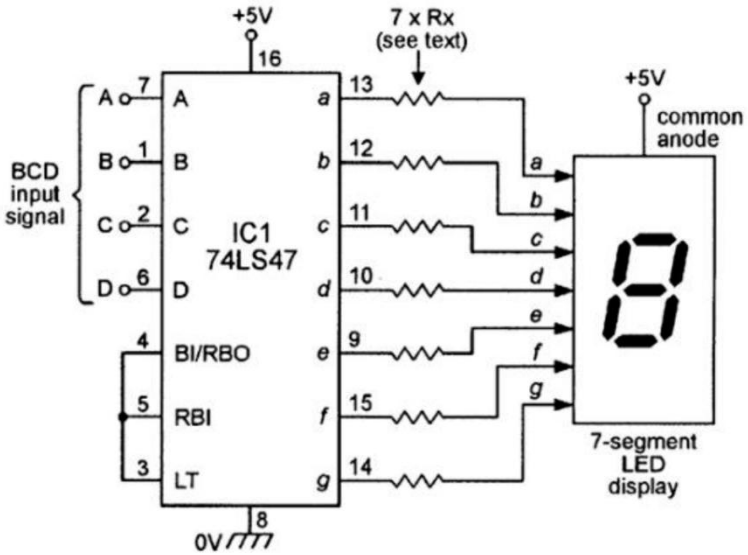
In this simple circuit, each anode terminal of the common cathode LED display is connected directly to the 4511 decoder/driver via a current limiting resistor. The cathodes of each LED segment are internally connected to ground. The binary inputs, A, B, C, and D to the 4511 are via four mechanical ON/OFF switches. When all the switches are in the open position, the voltage across the four 1kΩ resistors is zero (0V) as they are tied directly to ground. This prevents any false triggering of the display when any of the switches are open.



Then we can see that using a BCD to 7-segment display driver such as the CMOS 4511 or TTL 7447, we can control the LED display using just four switches (instead of the previous 8) or a 4-bit binary signal allowing up to 16 different combinations. Most digital equipment use 7-segment Displays for converting digital signals into a form that can be displayed and understood by the user. This information is often numerical data in the form of numbers, characters and symbols. Common anode and common cathode seven-segment displays produce the required number by illuminating the individual segments in various combinations. LED based 7-segment displays are very popular amongst Electronics hobbyists as they are easy to use and easy to understand. In most practical applications, 7-segment displays are driven by a suitable decoder/driver IC such as the CMOS 4511 or TTL 7447 from a 4-bit BCD input. Today, LED based 7-segment displays have been largely replaced by liquid crystal displays (LCDs) which consume less current.

JOBSHEET 4

Lakukan Simulasi BCD 7-segment display menggunakan software simulator seperti pada gambar skema di bawah ini dan jelaskan tahapan perakitan dan hasil simulasinya.



LAPORAN HASIL PERCOBAAN: