RAJSHAHI UNIVERSITY OF ENGINEERING AND TECHNOLOGY

CSE 3208

Report on 7-Segment Display Simulation

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Title: 7-Segment Display Simulation

Objectives: Display the decimal digits on 7-Segment Display using Proteus.

Introduction: The 7-segment display consists of seven LEDs arranged in a rectangular fashion. 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. 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 together 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.

The display's 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 displays called **Common Cathode** and **Common Anode**. The difference between the two displays 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.

1. The Common Cathode: 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).

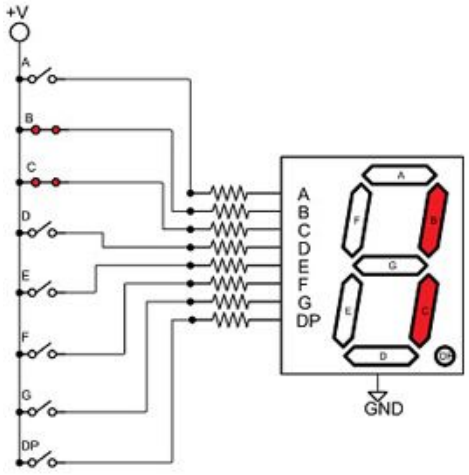


Fig: Common Cathode 7-Segment Display

2. The Common Anode: 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).

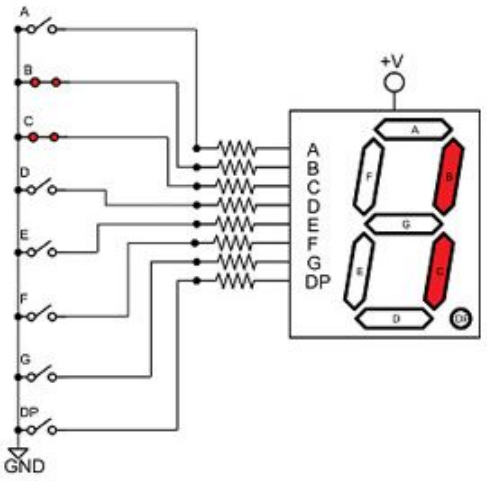


Fig: Common Anode 7-Segment Display

7-segment Displays are usually driven by a special type of integrated circuit commonly known as a 7-segment decoder/driver, such as the CMOS 4511. This 7-segment display driver, which is known as a Binary Coded Decimal or BCD to 7-segment display decoder and driver, is able to illuminate both common anode or common cathode displays. This BCD-to-7 segment decoder/driver takes a four-bit BCD input labelled A, B, C and D for the digits of the binary weighting of 1, 2, 4 and 8 respectively, has seven outputs that will pass current through the appropriate segments to display the decimal digit of the numeric LED display.

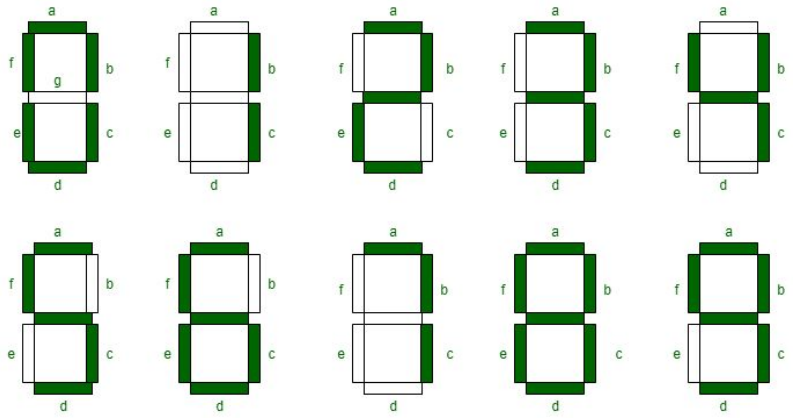


Fig: Segments illuminated for decimal digits

Tools:

1. Proteus Design Suite: ISIS Schematic Capture

Procedure:

1. Component selection:
    a. 7-Segment Display: a common cathode was selected (Model: 7SEG-COM-CAT-GRN).

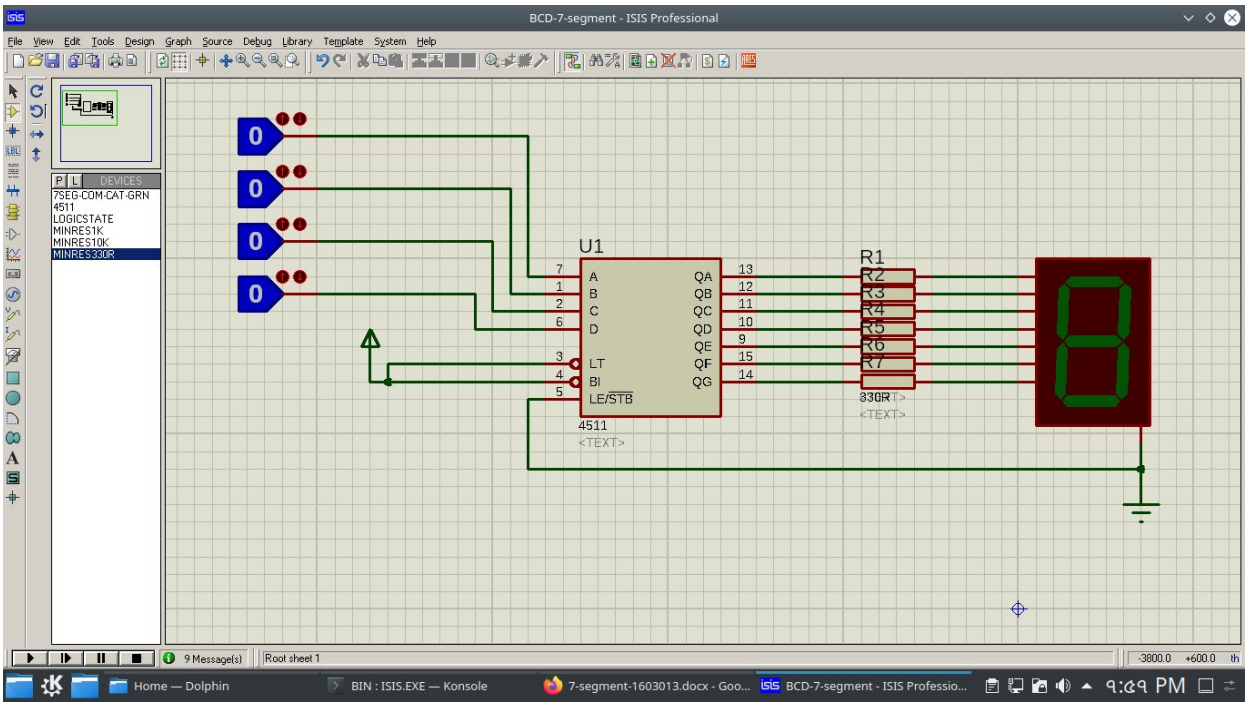
b. BCD to 7-Segment Decoder: to convert the BCD input to corresponding bit combination for the 7-Segment. The model selected for this purpose was 4511.
c. Resistors: to limit the current flow to the LEDs. 330 Ohm resistors were selected for this purpose.
d. Logic State: to change input of the BCD decoder.

2. Circuit Connection:
   a. The resistors were placed in between the corresponding output pins of the BCD decoder and input pins of the 7-Segment display.
   b. Pin 3 (LT) and 4 (BI) of 4511 were set to HIGH with a power supply component.
   c. Pin 5 of 4511 and common-cathode pin of 7-segment were connected to a ground component.
   d. The logis states were connected to the input pins of 4511 (Pin 7, 1, 2, 6)
3. After all connection was complete, the simulation was started to see if everything was fine.

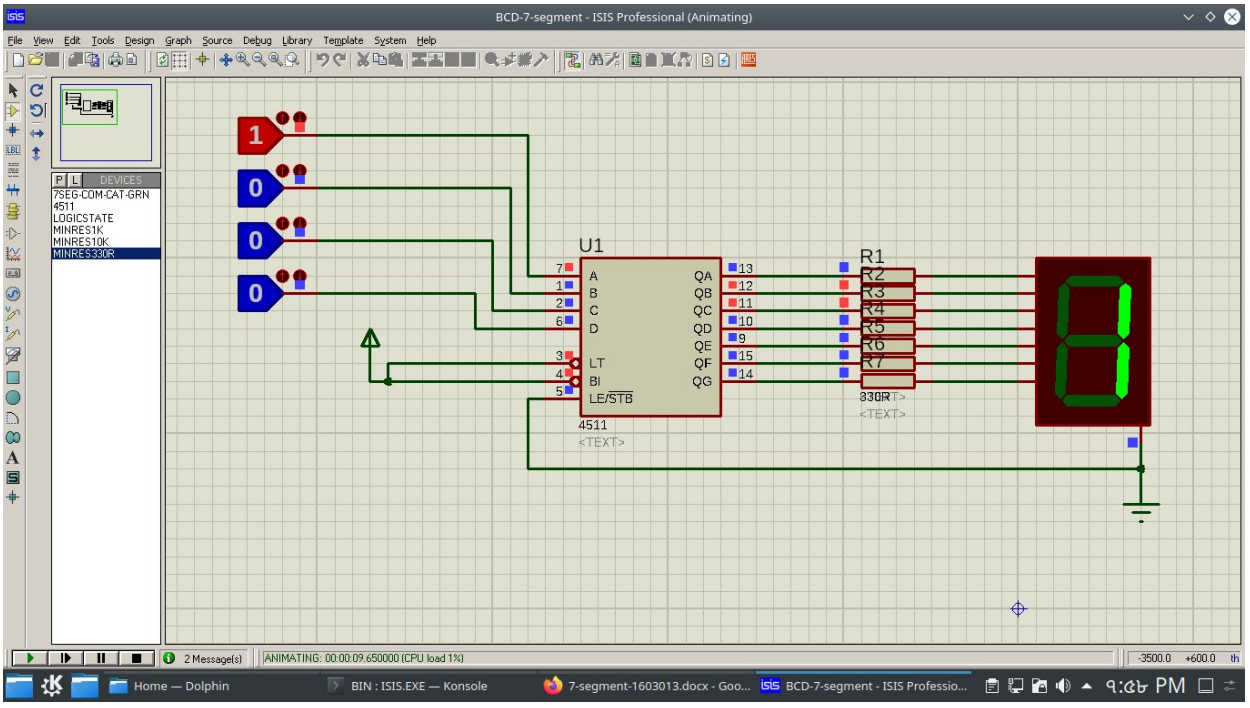
Truth Table:

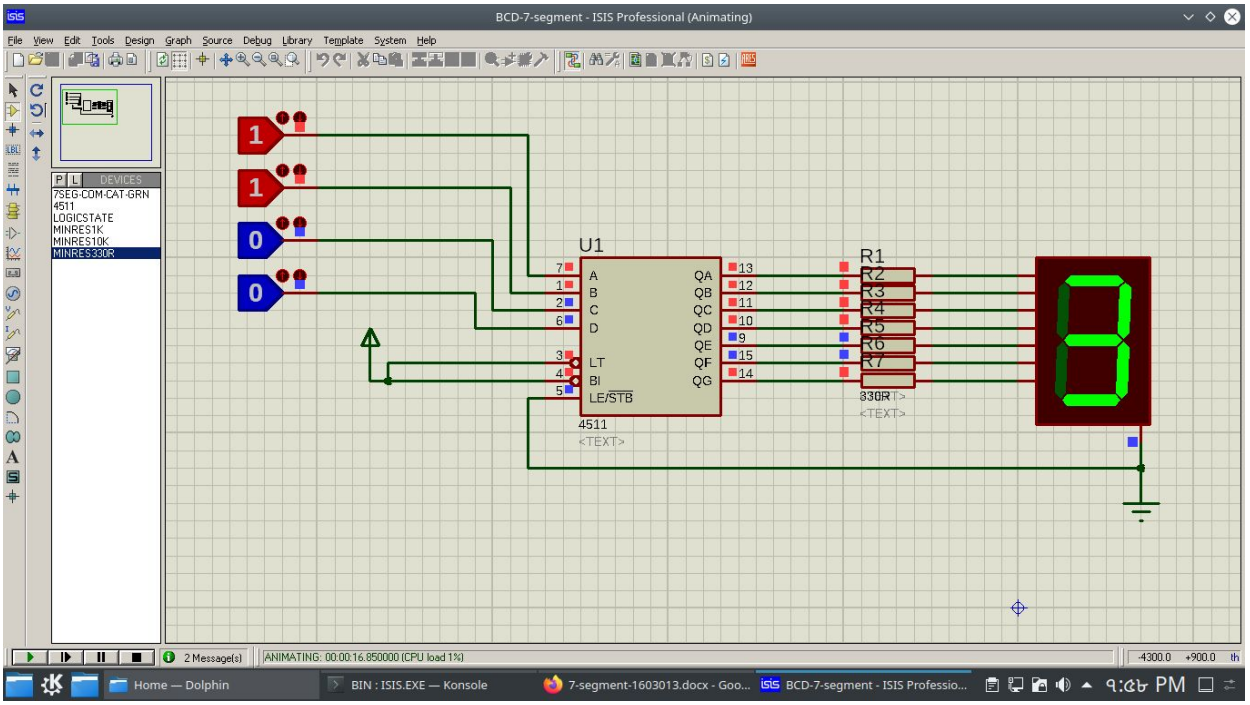
BCD input pins				**7-Segment input pins**						
D	**C**	**B**	**A**	**a**	**b**	**c**	**d**	**e**	**f**	**g**
0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	0	1	1	0	0	0	0
0	0	1	0	1	1	0	1	1	0	1
0	0	1	1	1	1	1	1	0	0	1
0	1	0	0	0	1	1	0	0	1	1
0	1	0	1	1	0	1	1	0	1	1
0	1	1	0	0	0	1	1	1	1	1
0	1	1	1	1	1	1	0	0	0	0
1	0	0	0	1	1	1	1	1	1	1
1	0	0	1	1	1	1	0	0	1	1

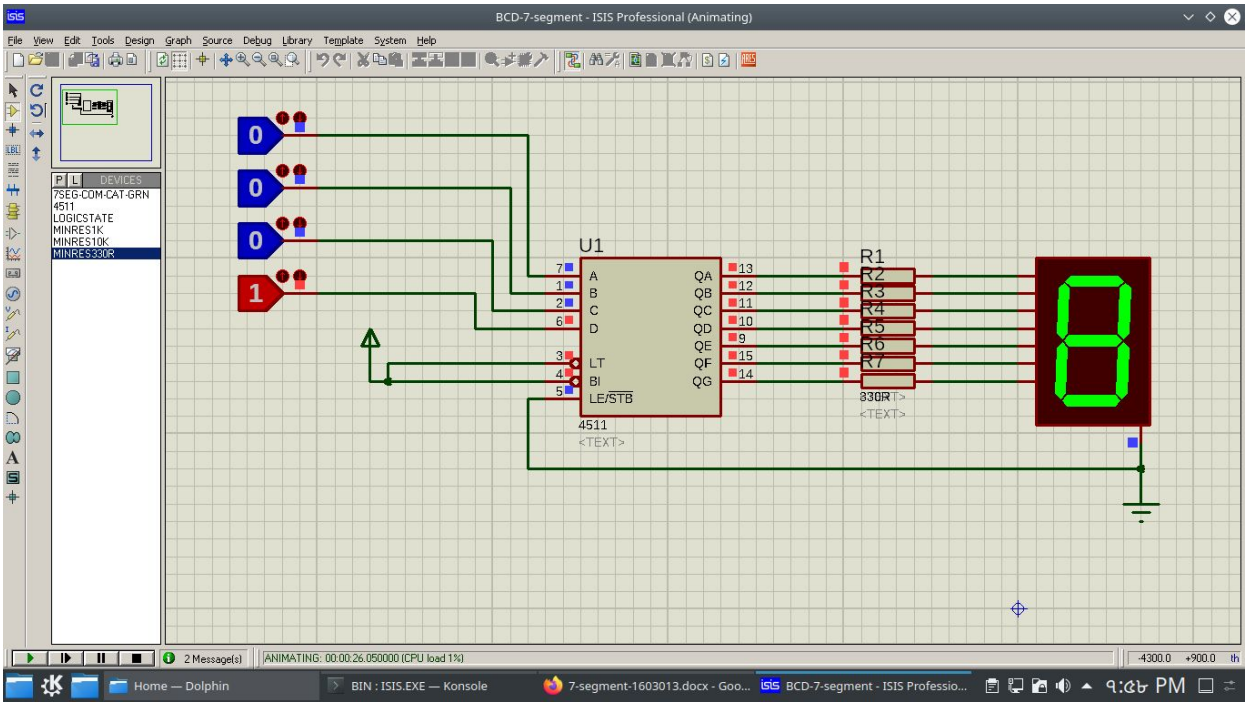
Configured Image:



Result:







Conclusion: The output of the display was correct for all valid inputs. Since a BCD decoder was used, the display did not show anything for inputs greater than 9 as it is supposed to be. To output all possible combinations, a HEX decoder needs to be used in place of the BCD decoder.