Section and Group No:

Name:

Signature:

EXP #6: SEVEN SEGMENT DISPLAY

Components that will be ensured by the students: IC 7447, Seven Segment LED Display

Objective(s):

The conversion from one binary code to another is common in digital systems. In this experiment, you will design and construct a BCD-to-seven segment decoder. In this context, you will learn and understand the working principles of IC 7447 and Seven-Segment Display

Introduction:

A BCD-to-seven-segment decoder accepts a decimal digit in BCD and generates the corresponding seven-segment code. The 7447 IC is a BCD-to-seven-segment decoder/driver that has four inputs for the BCD digit. Input D is the most significant and input A the least significant. The four-bit BCD digit is converted to a seven-segment code with outputs a through g.

A seven-segment indicator is used to display any one of the decimal digits 0 through 9. The display contains 7 LEDs. Each LED is called a segment and they are identified as (a, b, c, d, e, f, g) segments (Fig.1). The display has 7 inputs each connected to an LED segment.

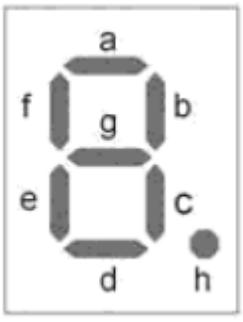


Fig. 1 Seven-Segment Display

Seven-Segment displays are of two types – Common Anode (CA) and Common Cathode (CC). When all anodes of LEDs are tied together and joined to 5 volts this type is called common anode type, and when all cathodes of LEDs are tied together and connected to ground this type is called common cathode type.

Shown below in Fig.2 is a common anode seven segment.

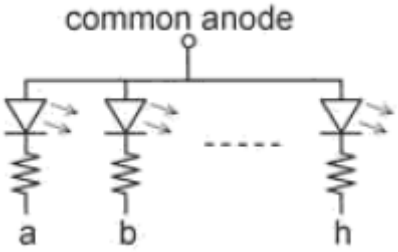


Fig.2. Connection for common anode type

When working with a CA seven segment display, power must be applied externally to the the anode connection that is common to all the segments. Then by applying a ground to a particular segment connection (a-g), the appropriate segment will light up. An additional resistor must be added to the circuit to limit the amount of current flowing through each LED segment.

A common cathode seven segment is different from a common anode segment in that the cathodes of all the LEDs are connected together (Fig.3). For the use of this seven segment, the common cathode connection must be grounded and power must be applied to appropriate segment in order to illuminate that segment.

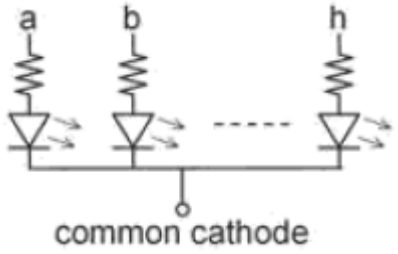


Fig.3 Connection for common catode type

Preliminary Work:

1) The integrated circuit (IC) 7447 is a 4 input and 7 output BCD-to-seven segment decoder. List the truth table of this decoder.

Binary Inputs				**Decoder Outputs**							**7 Segment Display Outputs**
A	**B**	**C**	**D**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	

2) Check and find out the pin diagram of the seven-segment display that you will be using. Find its datasheet if possible. Draw the pin configuration.

3) Using this decoder and a seven segment display (anode or catode) design and draw a circuit that displays the decimal value of the 4-bit input at Seven-Segment LED.

Laboratory Work:

1) Initially, test your Seven-Segment Display and identify its type (anode or catode?) You can realize this test via the diode testing feature of your multimeter.

2) Construct the circuit you designed in your preliminary work.

3) Apply the four-bit BCD digits through four switches, and observe the decimal display from 0 to 9.

4) Inputs 1010 through 1111 have no meaning in BCD. Depending on the decoder, these values may cause either a blank or a meaningless pattern to be displayed. Observe and record the output patterns of the six unused input combinations.

Input Lines				**Output Lines**							**Display Pattern**
A	**B**	**C**	**D**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	
1	0	1	0								
1	0	1	1								
1	0	0	0								
1	1	0	1								
1	1	1	0								
1	1	1	1								