DRIVING SEVEN DEGMENT DISPLAY USING DECODER AND ARDUINO

Aim

The aim of this project is to display a number between 0 to 9 (including both) by giving a keyboard input through Serial port, using arduino, decoder(binary to decimal) and a seven segment LED display.

Components used:

1. Arduino

2. Bread board

3. Wires (Solid core)

4. Decoder (DM74LS47)

5. Seven segment LED display (Common anode)

Description:

Arduino:

In the arduino, LOW will be considered as binary 0, and HIGH will be considered as binary 1.

Considering these two conditions, we can make an arrangement as the arduino gives out the 0s and 1s through its ports, which is connected to the each of the 4 legs of the DECODER.The output got by implementing the arduino code is given as input to decoder.

4 bit BCD to 7 SEGMENT DECODER:

The decoder takes a 4-bit binary-coded-decimal (BCD) and depending on the state of the auxiliary input, it decodes the data to drive a 7-segment display by using appropriate gates. Basically,the DM74LS47 decodes the input data as per the pattern indicating the segment display identification illustration. A decoder is a combinational circuit with no memory elements.

SEVEN SEGMENT DISPLAY:

1. Seven-segment display contains the arrangement of LEDs in "Eight" (8) fashion, and a Dot (.) with a common electrode, lead (Anode or Cathode). The purpose of arranging it in that fashion is that we can display any number by switching ON and OFF particular LED's.

   Common Cathode (CC) - All the 8 LEDs have same cathode. Common Anode (CA) - All the 8 LEDs have same anode.

2. Here we have used CA LED display. In a CA LED, all the 8 legs (a through h) are of cathode type and the common anode will be connected to the high voltage (5V) supply.

3. Now for displaying all the numbers from 0 to 9 on the display we need to switch the LED'S ON and OFF in a particular manner to display a number. But this effort of switching the LED's ON and OFF manually can be totally minimized by just interfacing the SEVEN SEGMENT DISPLAY with a arduino and a decoder.

Circuit Diagram
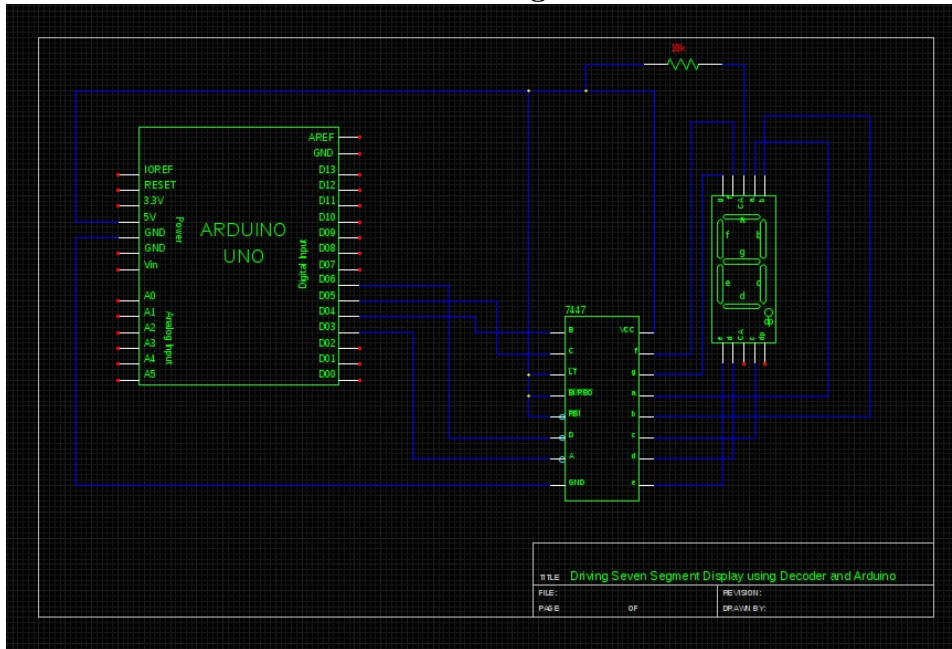
Truth Table of Decoder

Decimal or Function	Inputs						BI/RBO	Outputs							Note
	LT	RBI	D	C	B	A	(Note 1)	a	b	c	d	e	f	g	
0	H	H	L	L	L	L	H	L	L	L	L	L	L	H	
1	H	X	L	L	L	H	H	H	L	L	H	H	H	H	
2	H	X	L	L	H	L	H	L	L	H	L	L	H	L	
3	H	X	L	L	H	H	H	L	L	L	L	H	H	L	
4	H	X	L	H	L	L	H	H	L	L	H	H	L	L	
5	H	X	L	H	L	H	H	L	H	L	L	H	L	L	
6	H	X	L	H	H	L	H	H	H	L	L	L	L	L	
7	H	X	L	H	H	H	H	L	L	L	H	H	H	H	(Note 2)
8	H	X	H	L	L	L	H	L	L	L	L	L	L	L	
9	H	X	H	L	L	H	H	L	L	L	H	H	L	L	
10	H	X	H	L	H	L	H	H	H	H	L	L	H	L	
11	H	X	H	L	H	H	H	H	H	L	L	H	H	L	
12	H	X	H	H	L	L	H	H	L	H	H	H	L	L	
13	H	X	H	H	L	H	H	L	H	H	L	H	L	L	
14	H	X	H	H	H	L	H	H	H	H	L	L	L	L	
15	H	X	H	H	H	H	H	H	H	H	H	H	H	H	
BI	X	X	X	X	X	X	L	H	H	H	H	H	H	H	(Note 3)
RBI	H	L	L	L	L	L	L	H	H	H	H	H	H	H	(Note 4)
LT	L	X	X	X	X	X	H	L	L	L	L	L	L	L	(Note 5)

Working Principle

- User enters a number through serial port.Arduino converts it into binary form. Later these 4 bits are used as 4 OUTPUT through pins of arduino.

- Here pins 6,5,4,3(digital pins) carry first, second, third and fourth bit. Now the 7 pins on the other side of the decoder are connected to the respective legs(a,b,c,d,e,f,g) of the display.

- Now the GND AND VCC are connected to the pins of the decoder. The pins (3,4,5) are BI/RBO,LT,RBI which are connected to HIGH(VOLTAGE 1) according to the truth table of the DM74LS47 decoder.

- So,each segment of the display is associated with a Boolean equation that determines whether the segment will ON or OFF.

RESULT - Display single digit number on display as per keyboard input.