



Lab no 07: Decoder & Seven Segment Display

The purpose of this Lab is to: be familiar with the decoder, seven-segment display, and Proteus Simulator. In this lab, you will simulate the seven-segment decoder and then test it on the breadboard.

Required Components

- Breadboard.
- 5V battery.
- Jumper wires.
- 330-ohm Resistor.
- Digital 7 segments display anode.
- Digital 7 segments decoder IC 74ls47.

Parts:

- 1. Introduction to BCD & 7-segment Display.**
- 2. Simulate the Decoder IC & 7-Segment Display on Proteus.**
- 3. Task: Hardware Connection.**



Part 1: Introduction to BCD & Seven-Segment Display

- **Binary Coded Decimal (BCD)** encoding scheme represents the decimal numbers (0-9) by its equivalent binary pattern (which is 4 bits). For example, 7 in decimal is represented as 0111 in binary).
- **Seven Segments Display** is an electronic device that consists of seven Light Emitting Diodes (LEDs) arranged in some definite pattern. It is used to display Hexadecimal numbers (0 to F) or decimal numbers, BCD (0 to 9). LED type can be a common cathode or common anode, as shown in Figure 1. Seven-segment displays are widely used in digital clocks, electronic meters, basic calculators, and other electronic devices that display numerical information.

In a 7-segment display, each of the seven segments is activated for various digits. For example, segment a is activated for the digits 0, 2, 3, 5, 6, 7, 8, and 9, as illustrated in Figure 1.

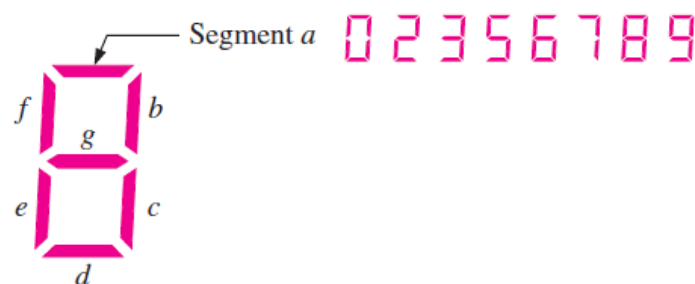


Figure 1. Seven Segment Display

➤ Two Types of Seven-Segment LED Display:

- **Common Cathode Type:** In this type of display all cathodes of the seven LEDs are connected to the ground (low voltage). LEDs display digits when some 'HIGH' signal is supplied to the individual anodes.
- **Common Anode Type:** In this type of display all the anodes of the seven LEDs are connected to the +Vcc (High voltage). LEDs display digits when some 'LOW' signal is supplied to the individual cathodes.

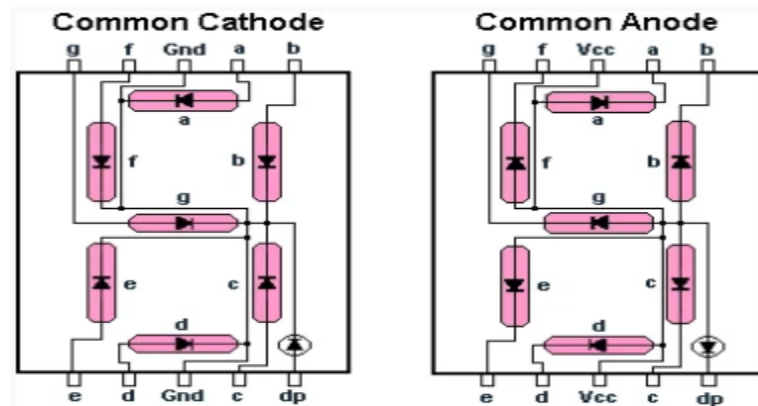


Figure 2. Common Cathode/Anode Seven Segment Display

Part 2: Simulate the Decoder IC & 7-Segment Display on Proteus.

74LS47 is a BCD to 7-Segment (common Anode) Decoder/Driver In 16-DIP Package, as shown in Figure 3. The pinout and its functions are discussed below.

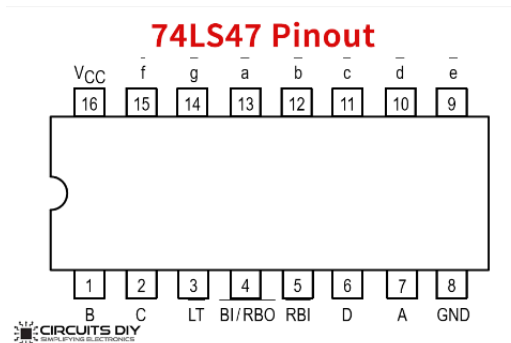
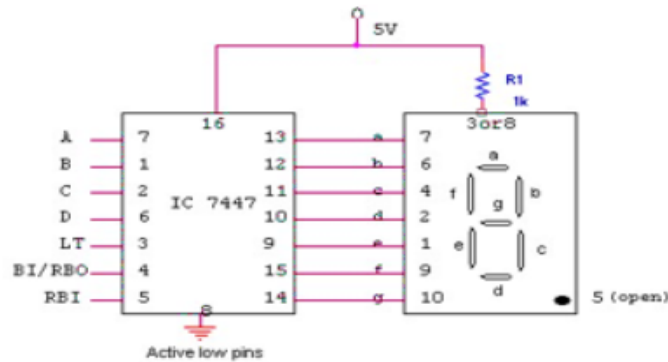


Figure 3. 7447 decoder IC & Pin Configuration & Digital Seven segments display.



➤ Steps To Connect Decoder 74ls47 To 7 Segments In Proteus.



TRUTH TABLE:

BCD Inputs				Output Logic Levels from IC 7447 to 7-segments							Decimal number display
D	C	B	A	a	b	c	d	e	f	g	
0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	1	1	0	0	1	1	1	1	1
0	0	1	0	0	0	1	0	0	1	0	2
0	0	1	1	0	0	0	0	1	1	0	3
0	1	0	0	1	0	0	1	1	0	0	4
0	1	0	1	0	1	0	0	1	0	0	5
0	1	1	0	1	1	0	0	0	0	0	6
0	1	1	1	0	0	0	1	1	1	1	7
1	0	0	0	0	0	0	0	0	0	0	8
1	0	0	1	0	0	0	1	1	0	0	9

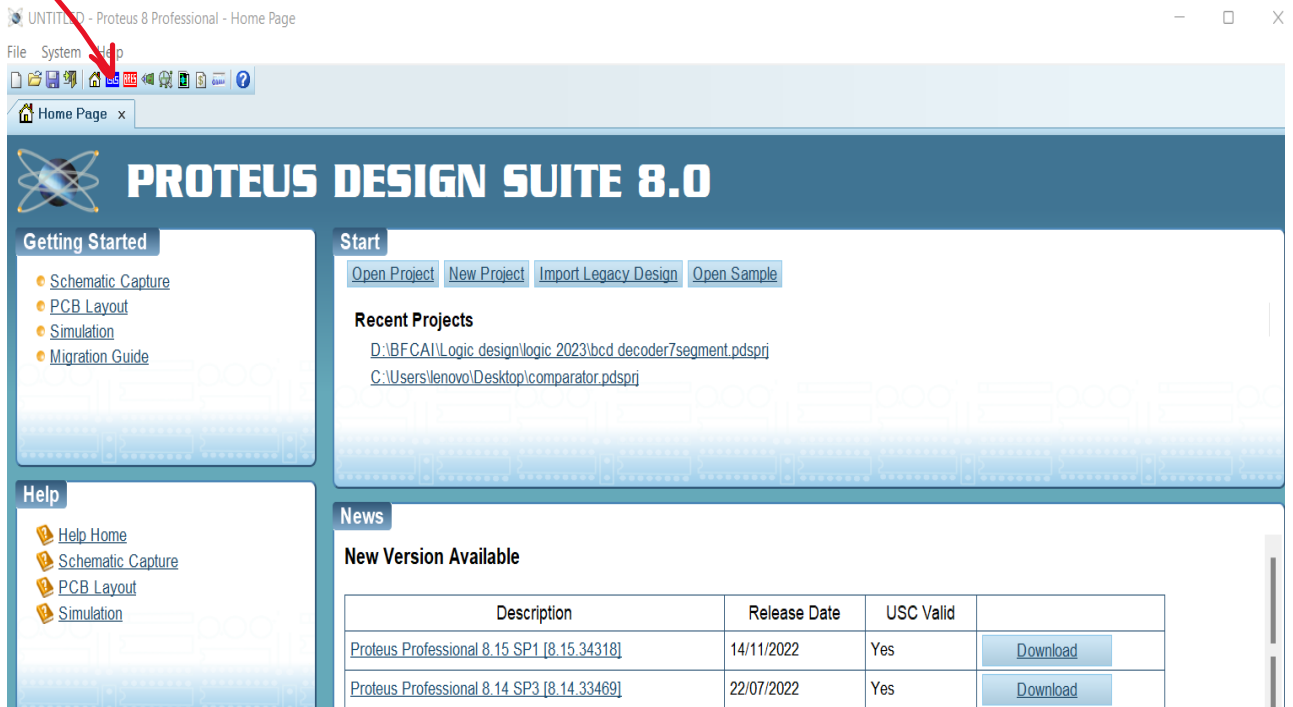
Figure 2: Schematic of BCD decoder 7segment and truth table of Inputs/Outputs.

- **Open** Proteus Software.

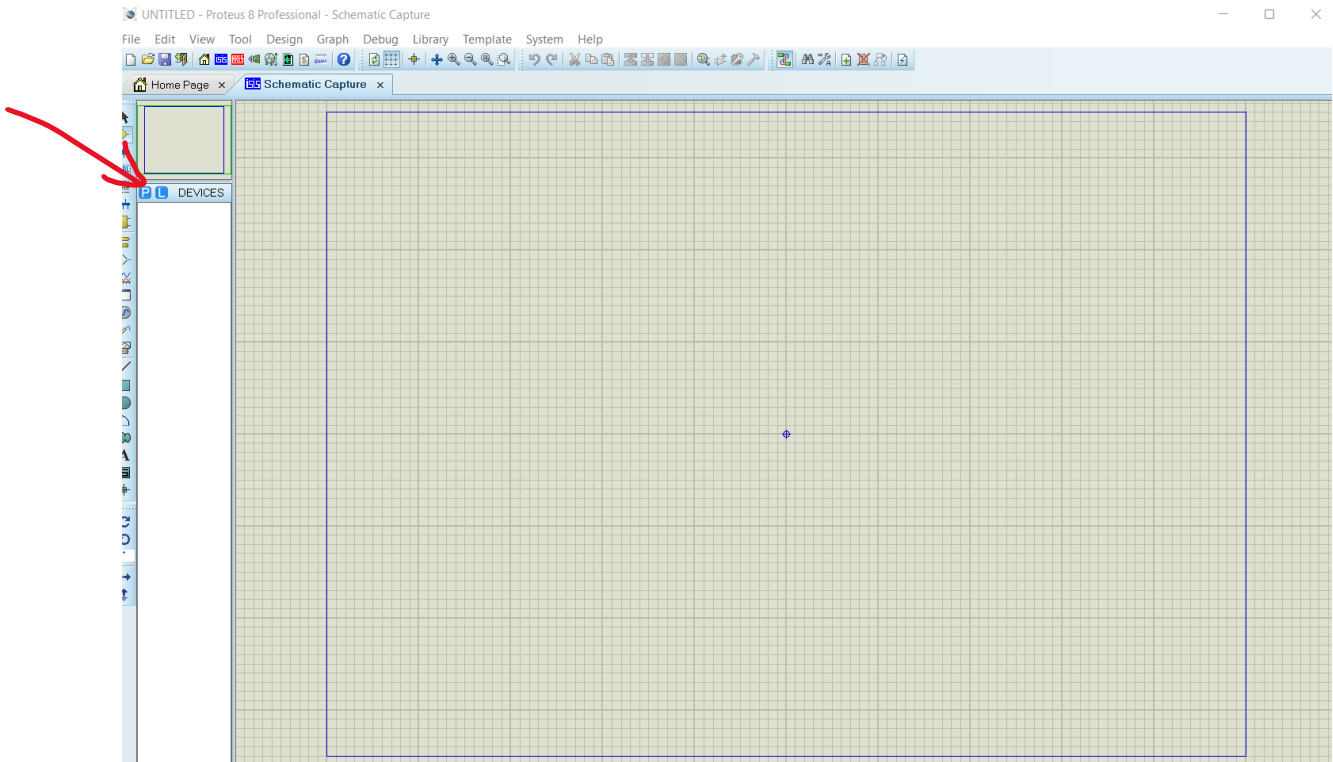




- **Open** schematic capture

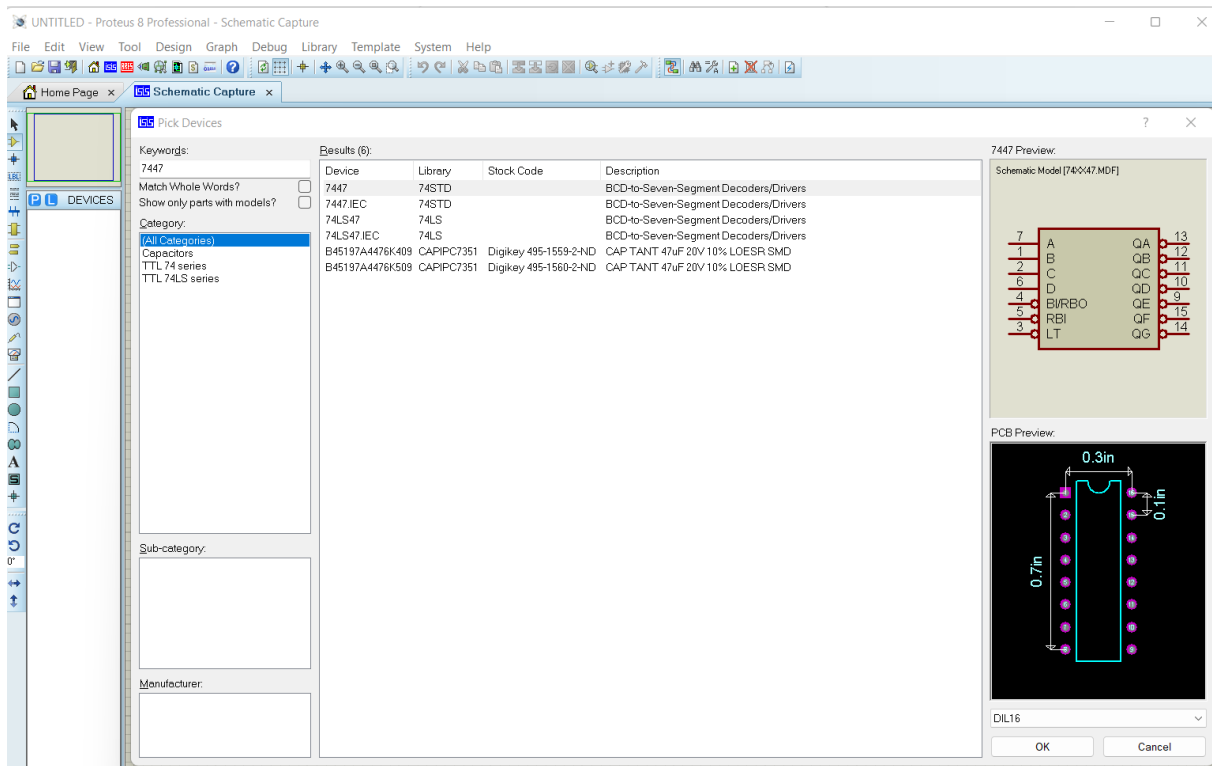


- **Open** pick devices from devices

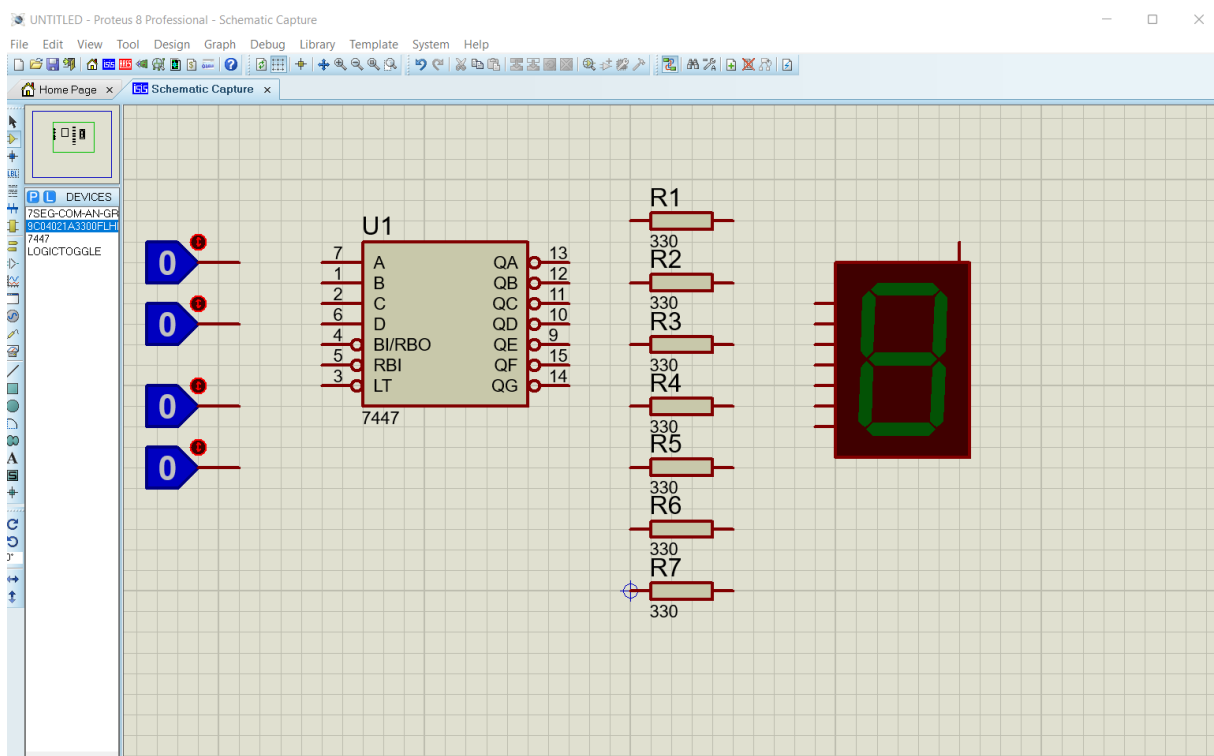




- Search for ic **74ls47** and add schematic.

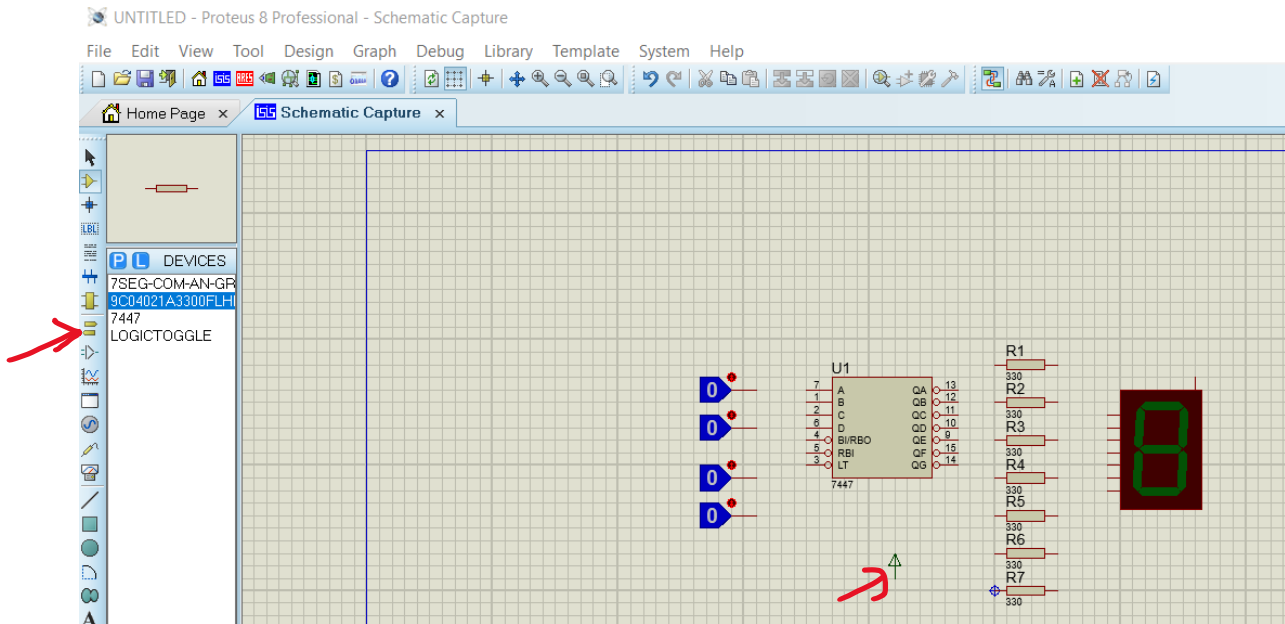


- **Add** resistors 330 ohms from pick devise, toggles (inputs), and anode 7 segments.

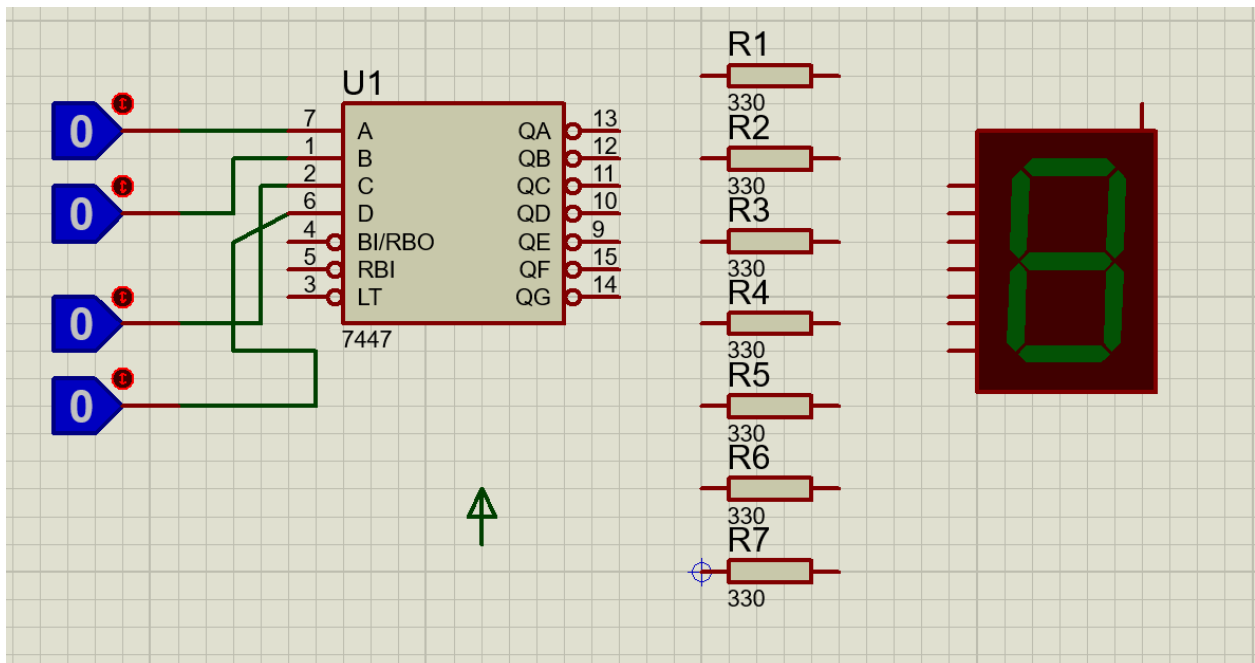




- **Add** power from the terminal mode

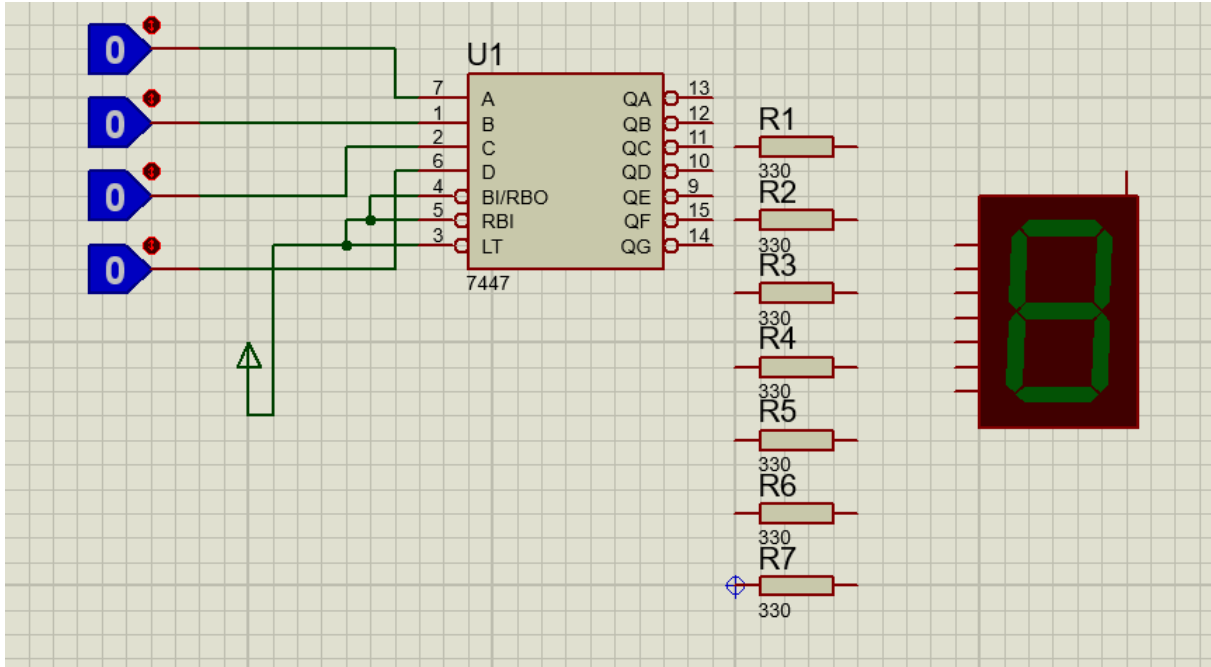


- **Connect** Inputs of the decoder, A Pin 7, B Pin 1, C Pin 2, and D Pin 6, as shown in the Figure. Refer to Pinout Figure 3.

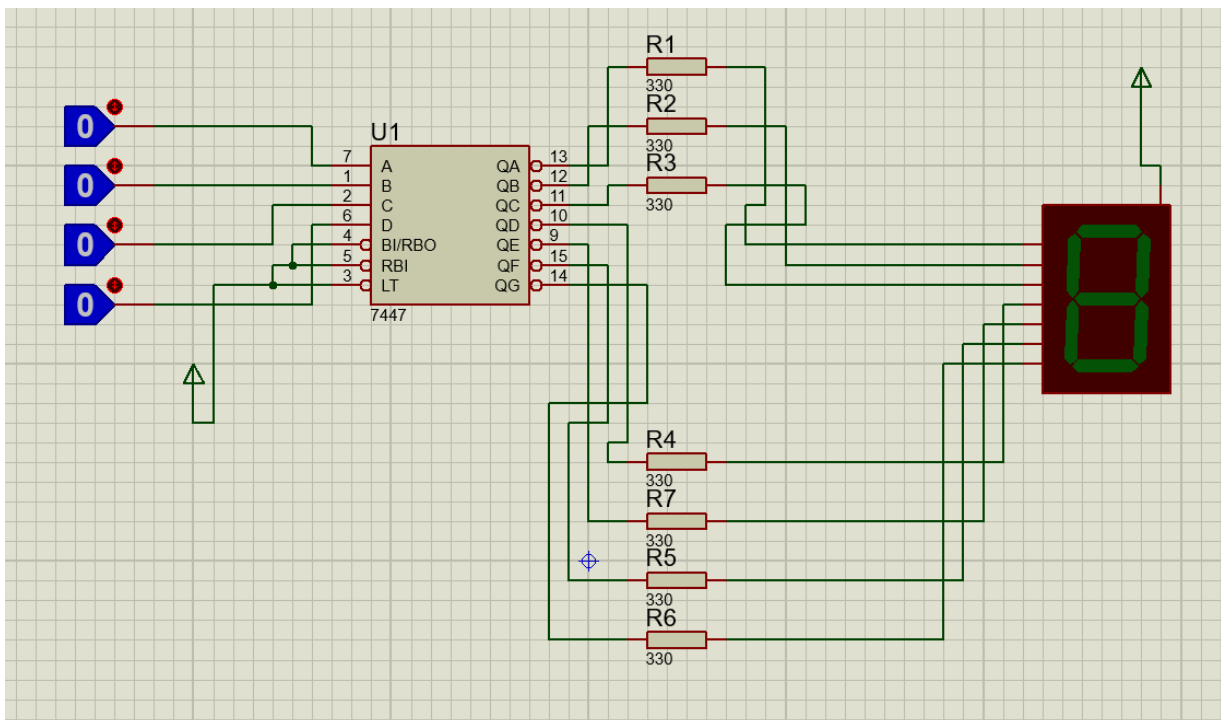




- Connect LT (Pin 3) and BI/RBO (Pin 4) and RBI (Pin 5) to the 5V power (logic 1).

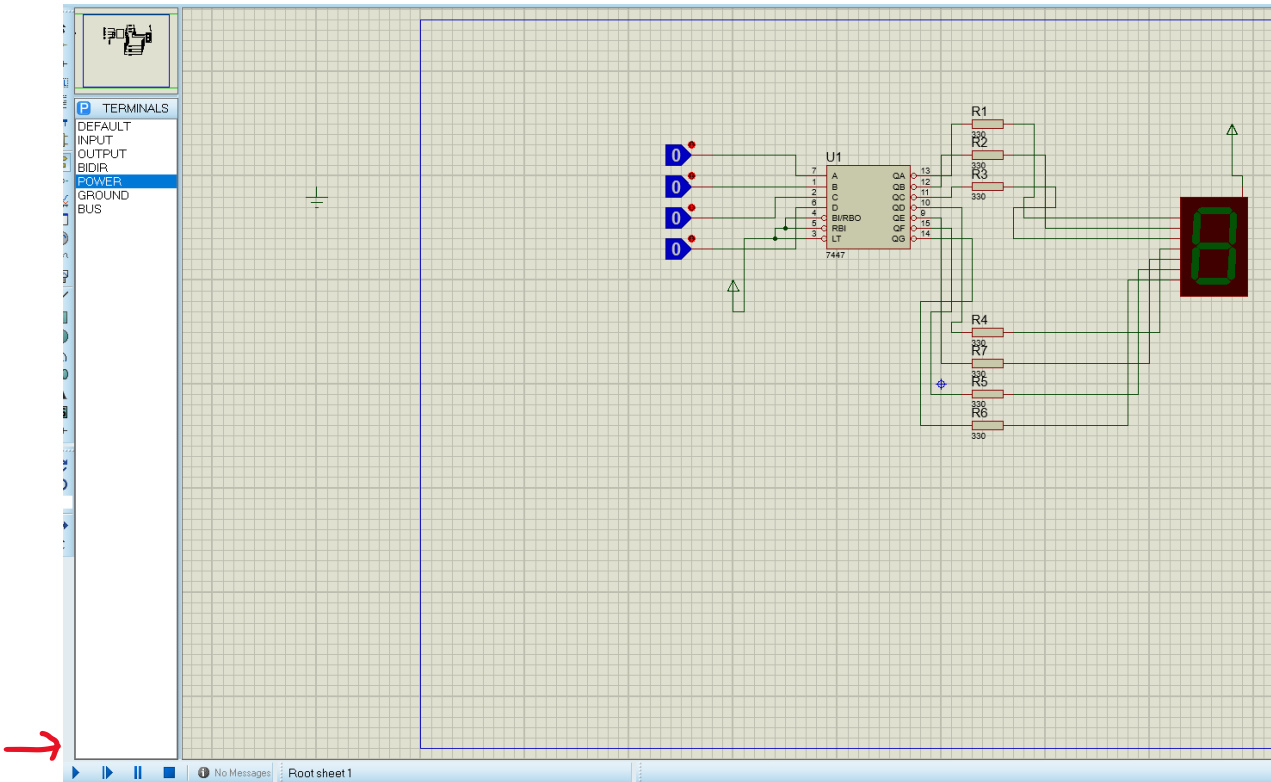


- **Connect** Output 'QA' to 'QG' from 74ls47 to R1 to R7, 330Ohm resistors. **Connect** R1 to R7 to 'a' to 'g' LEDs in the seven segments display anode. **Connect** the common anode pin in the seven segments display to the VCC (logic 1).

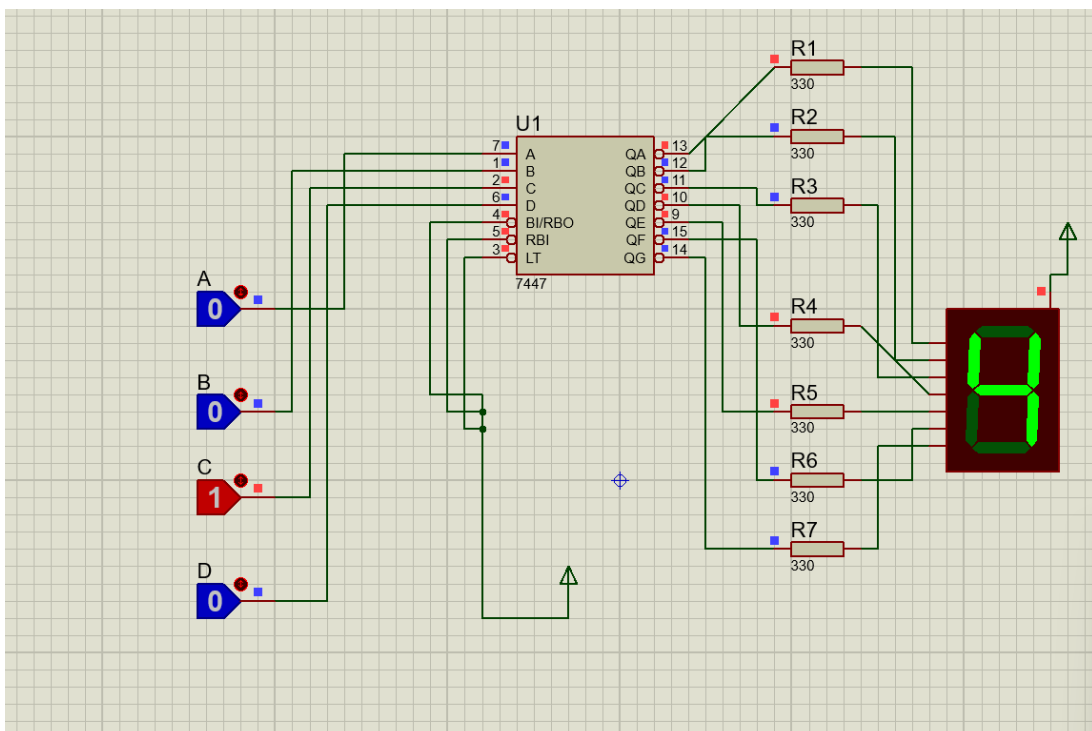




- Click on run simulation



- Case study if input A =0, B=0, C=1, D=0 the decimal number in 7 segment will be 4 (output).





Part 3: Task: Hardware Connections.

Now, it is your turn. On the breadboard, **Connect** the Seven-Segment decoder 7447 IC and the Seven-Segment Display, as you simulated on Proteus. Then **Test** the function of 7447 IC by varying the inputs and checking the output digit.

Note

- **Install Proteus at this link**

https://www.youtube.com/watch?v=pzpF5FGlk1Y&list=PL_teBX5d56mC-QhpRbaTZ6QPR9tB1X1ng&index=13

- **BCD decoder 7 segment in proteus file**

https://drive.google.com/file/d/1xb0-T8anT2w92YVpU-dFcbFd9K_bXO3F/view?usp=sharing