

Microprocessor Systems and Interfacing

MINI PROJECT 1



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Class	Microprocessor Systems and Interfacing CPE342 (BCE-6B)
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Mini Project 1:

➤ Task 1: Controlling a 7-Segment display using a single I/O pin

Project Description

1. In this Project, I used 3 pins of the Microcontroller, one I/O pin to send data (one bit at a time) and the other two pins as control pins. (as latch and clock).
2. To do this, I used an IC 74HC595, which is a shift register taking serial input and giving parallel output, I have used this phenomenon to my advantage here by sending data serially bitwise.
3. The IC works on the following principles:
 - a) Clock and Latch are initially set to low.
 - b) Clock is set to high.
 - c) Serial data is set to DS of IC.
 - d) Clock is set to Low.
 - e) After 8 iterations when all 8 bits are set on parallel output of IC, then Latch is set to high, this shows the data on the seven segment that is connected with the parallel output obtained from IC.
4. As the task required to repeat digits 0-9, so I made a nested loop, the outer loop runs from 0-9 (the digits) and the inner loop runs from 0-7.(checking all 8 bits)

Problems faced while Implementation.

I faced problems while writing the code, needed accuracy when setting latch to high and when to change state of clock.

Initially I was setting latch high after every bit which was not giving me my desired result then I saw some YouTube videos which explained the working of Shift register IC which helped me in completion of this task.

After a thorough understanding of the whole task, I implemented the circuit on the breadboard.

Research

When I searched on the internet, I came across this shift register IC. I saw videos and read some articles explaining its working, then I started working on writing a suitable code that works on my simulation.

Used Components:

Sno	Name	Quantity
1	7 Segment Common Anode	1
2	Resistor 100Ohm	8
3	Arduino Uno	1
4	Connecting Wires	11
5	74HC595 IC	1
5	Bread board	1

Reference Links

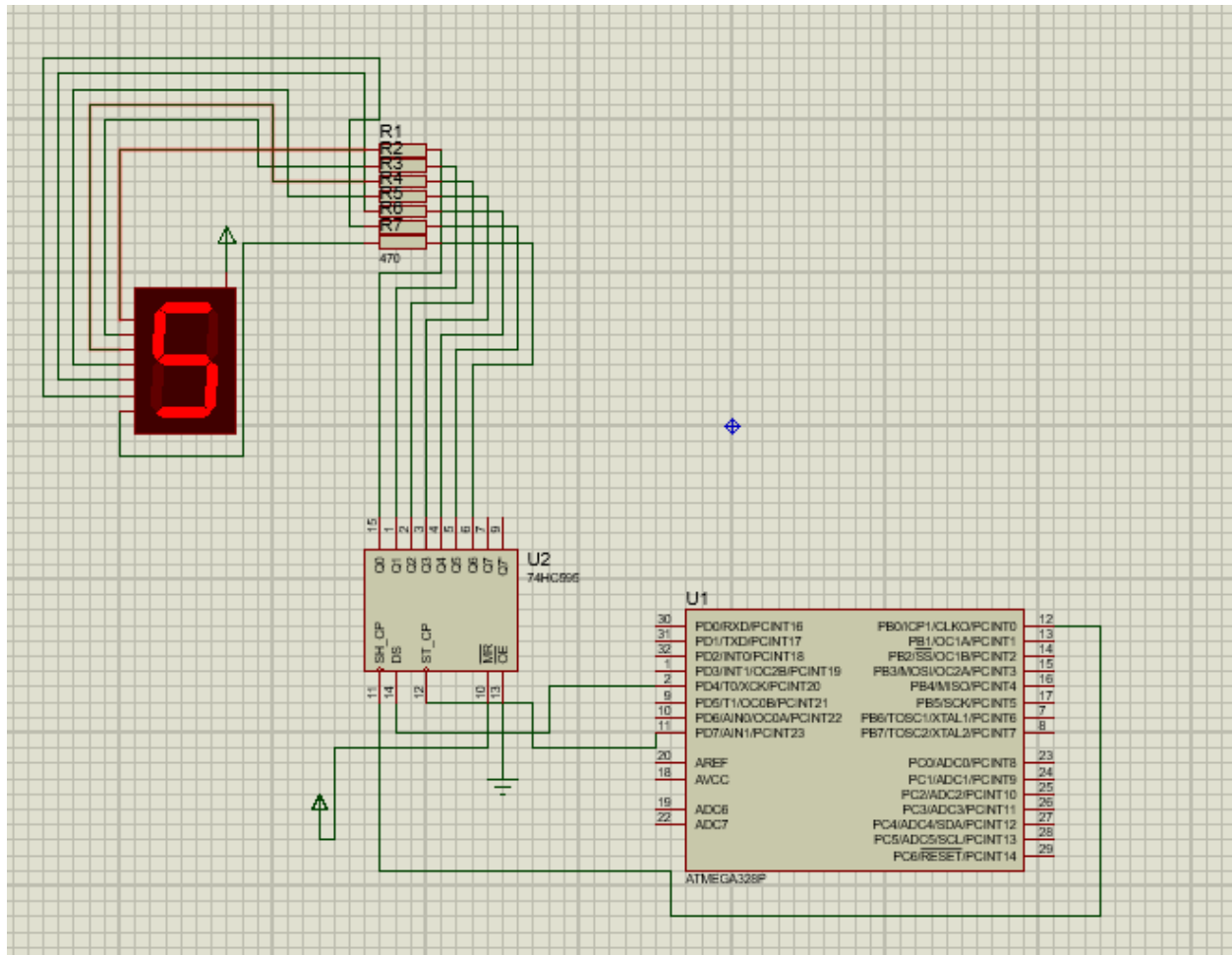
<https://www.youtube.com/watch?v=hvxCP2Q6jN8>

<https://www.arduino.cc/en/Tutorial/Foundations/ShiftOut>

<https://lastminuteengineers.com/74hc595-shift-register-arduino-tutorial/>

Simulation Design:

The complete Simulation file is included in the folder.



Video:

Video of hardware is included in the folder.

Task 2: Controlling four 7-segment displays using a single data bus

Project Description

1. In the task 2, I again used 3 pins of the Microcontroller, one to send data (one bit at a time) and the other two pins as control pins. (as latch and clock).
2. I used the Serial output pin of 74HC595 IC, I sent a 32-bit binary code as serial input to the first IC connected with one 7 segment, and I connected the serial output of first IC with the Serial input (DS) of second, and serial output of second with the serial input of third and serial output of third with serial input of fourth.
3. How this worked is that each shift register has 8 bit parallel output pins, if the bits exceed 8 bits, the most significant bit is available at the serial output pin. Hence, I made full use of this and used only 1 data pin to control all four 7 segments.
4. I made the Clock and Latch pin common for all ICs as data is being transmitted through one pin only.
5. The IC works on the same principle as given above:
 - a) Clock and Latch are initially set to low.
 - b) clock is set to high.
 - c) Serial data is set to DS of IC.
 - d) Clock is set to low.

Problems faced while implementation.

At first, I made the simulation using 4 input data (DS) pins. One for each IC to input 4 different numbers, but then I discovered that IC had a feature of serial output, then I implemented this on proteus and made changes to my code.

Initially I faced problems while making a path on Veroboard, I wasted a lot of soldering wire to make some paths, later we were shown a way in class which helped a lot. I exactly followed that way of using wires to connect the components and after a few hours of making and verifying connections I was finally successful at making a working hardware.

Research

Reading about this shift register helped a lot as otherwise I would not have come across this serial output pin.

Reference Links

<https://www.youtube.com/watch?v=hvxCP2Q6jN8>

<https://www.arduino.cc/en/Tutorial/Foundations/ShiftOut>

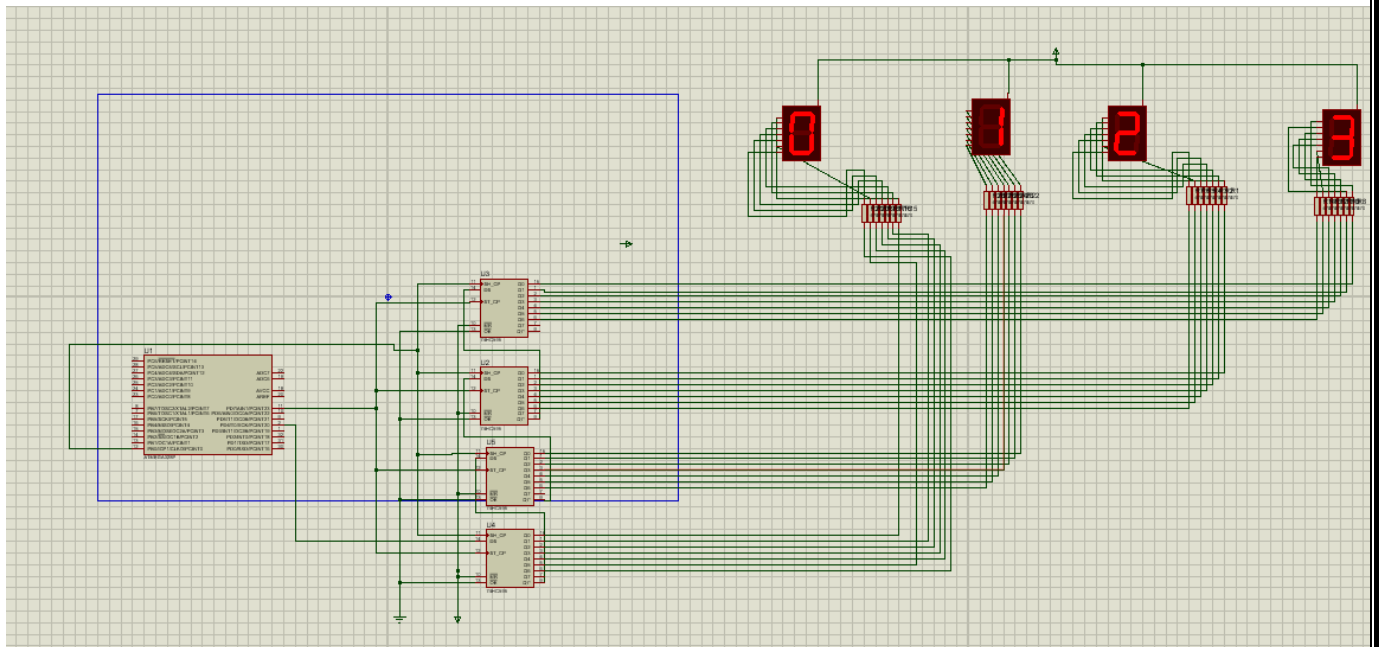
<https://lastminuteengineers.com/74hc595-shift-register-arduino-tutorial/>

Used Components:

Sno	Name	Quantity
1	7 Segment Common Anode	4
2	16-Pin IC base	4
3	Female to Male Headers	10
4	Connecting Wires	4m
5	On- Off Button	1
6	74HC595 IC	4
7	Veroboard Single sided	1

Simulation Design:

The complete Simulation file is included in the folder.



Video:

Video of hardware and video of soldering included in the folder

- The simulations, videos, pictures and code of both the tasks are included in the given folder.
