8x8x8 3D LED CUBE AND PRINTED CIRCUIT BOARD

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Abstract

We started this project to make an 8x8x8 Led Cube which is capable of showing pre-defined animations.

We soldered the whole structure of 512 LEDs using copper wires. We made our own PCB for the very first time in this institute. We designed our own circuit & connected it to the cube using Arduino Uno. We have control over each of the 512 LEDs through the interface of structure, electronic circuit & Arduino.

At last, it is always fun in learning something new. We learned many things about electronics circuits, PCB designing, PCB making, Soldering, working of Arduino and some programming of Arduino which may help us in future.

Introduction

Theory:-
A LED cube is like a LED screen, but it is special as it has 3D. We can think it as of low-resolution displays.
In normal displays, it is normal to stack pixels closer to each other in order for better resolution but the LED cube has its limits.
Working:-
The LED cube has 512 LEDs. So it is impractical to dedicate an IO port for each LED. Instead
of an LED cube rely on an optical phenomenon called Persistence of vision. If you flash a
LED really fast it will remain in your retina for some time even after LED is switched off. By
flashing each layer of cube very fast after one another it gives the feeling of 3D.

With this setup, we will need only 64(anode) + 8(layers) IO ports to control each led.

Budget

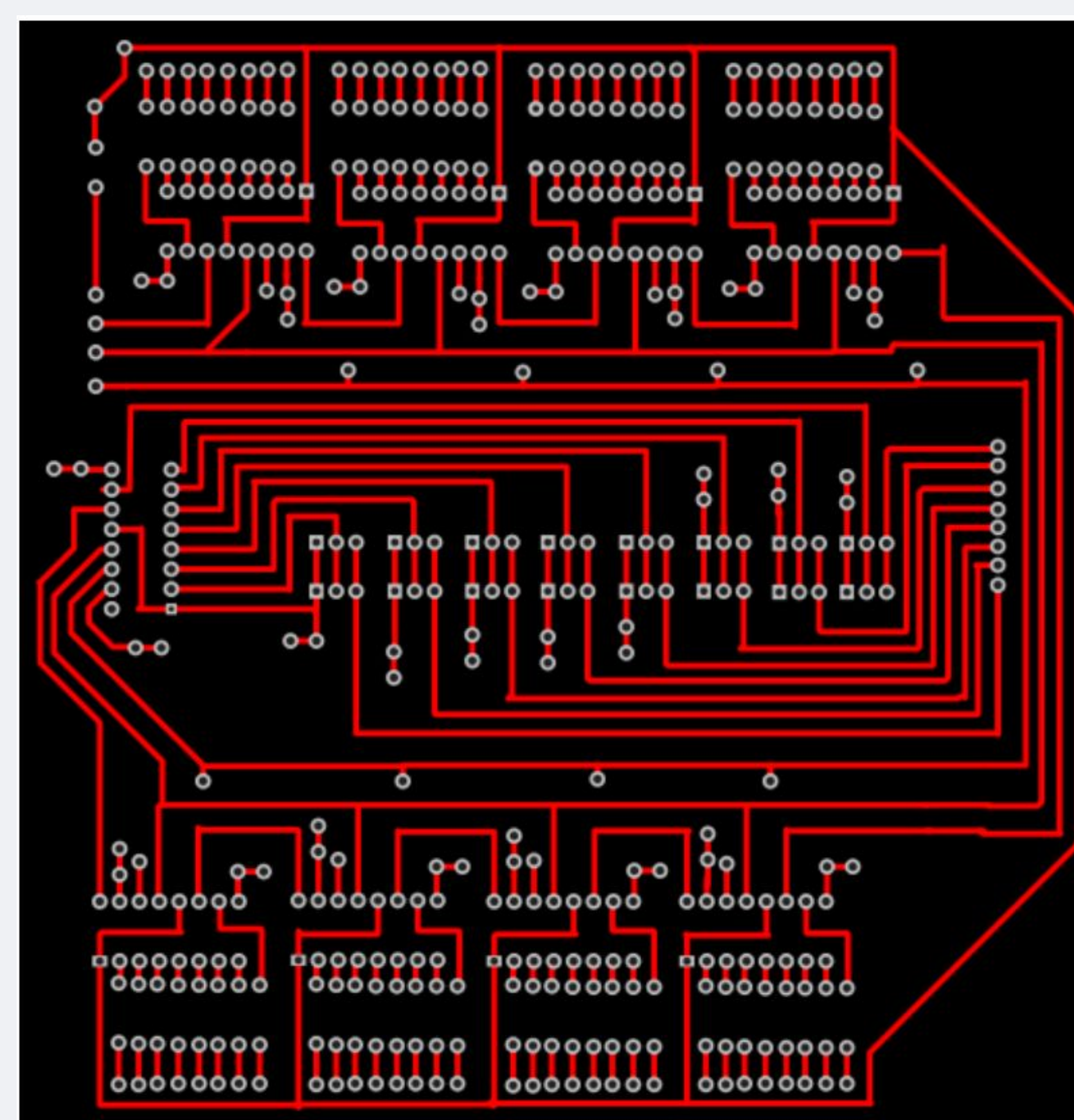Total available budget : Rs. 6160
Used : Around Rs 3000

Printed Circuit Diagram

We have used 9-Shift Registers 74HC595. The first 8-Shift Registers are for the pillars (anode). The 8 IO pins of a Shift Registers are connected to a base of NPN transistor. The emitter is connected to pillar and collector is given 5V. The 8 IO pins of Shift Registers for layers (cathode) is also connected to a base of NPN transistor but here the collector is connected to the layers and emitter is grounded.
The 3 pins of each Shift Registers will be connected to the ARDUINO UNO. These three pins will decide what value to be assigned to the IO pins.
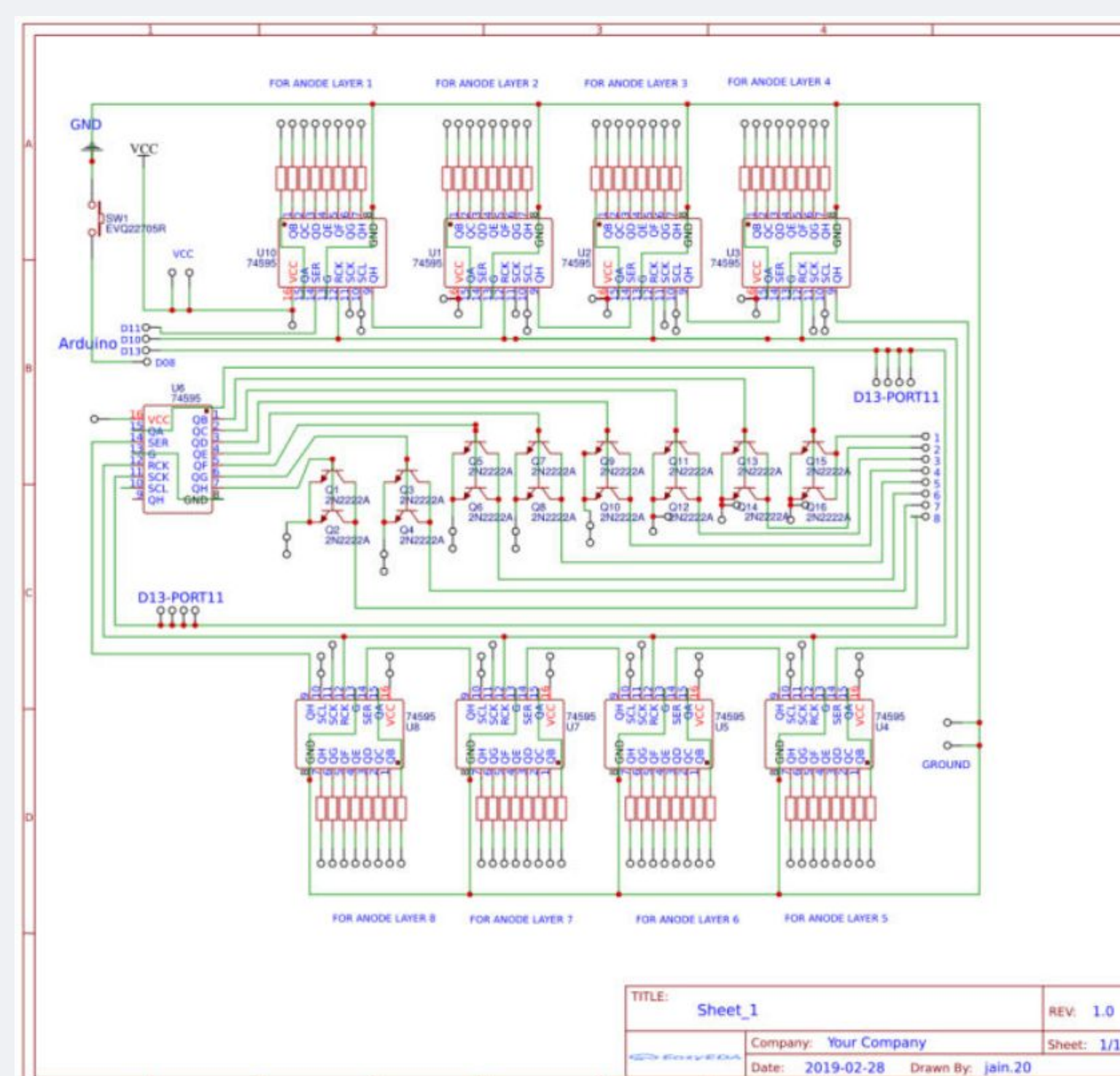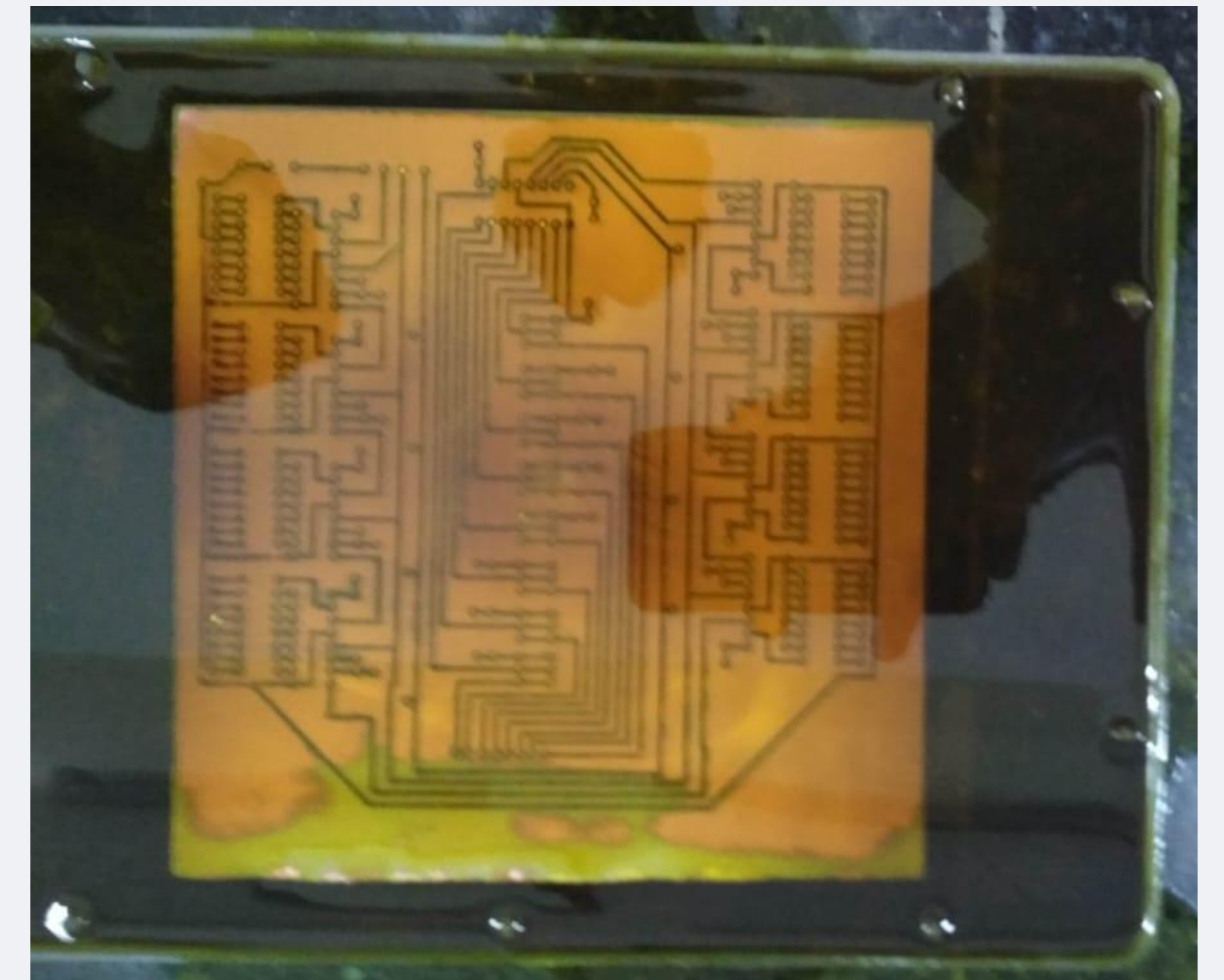

Schematic Diagram of Circuit

We have Designed the circuit on PCB and used SELF-MADE PCB.
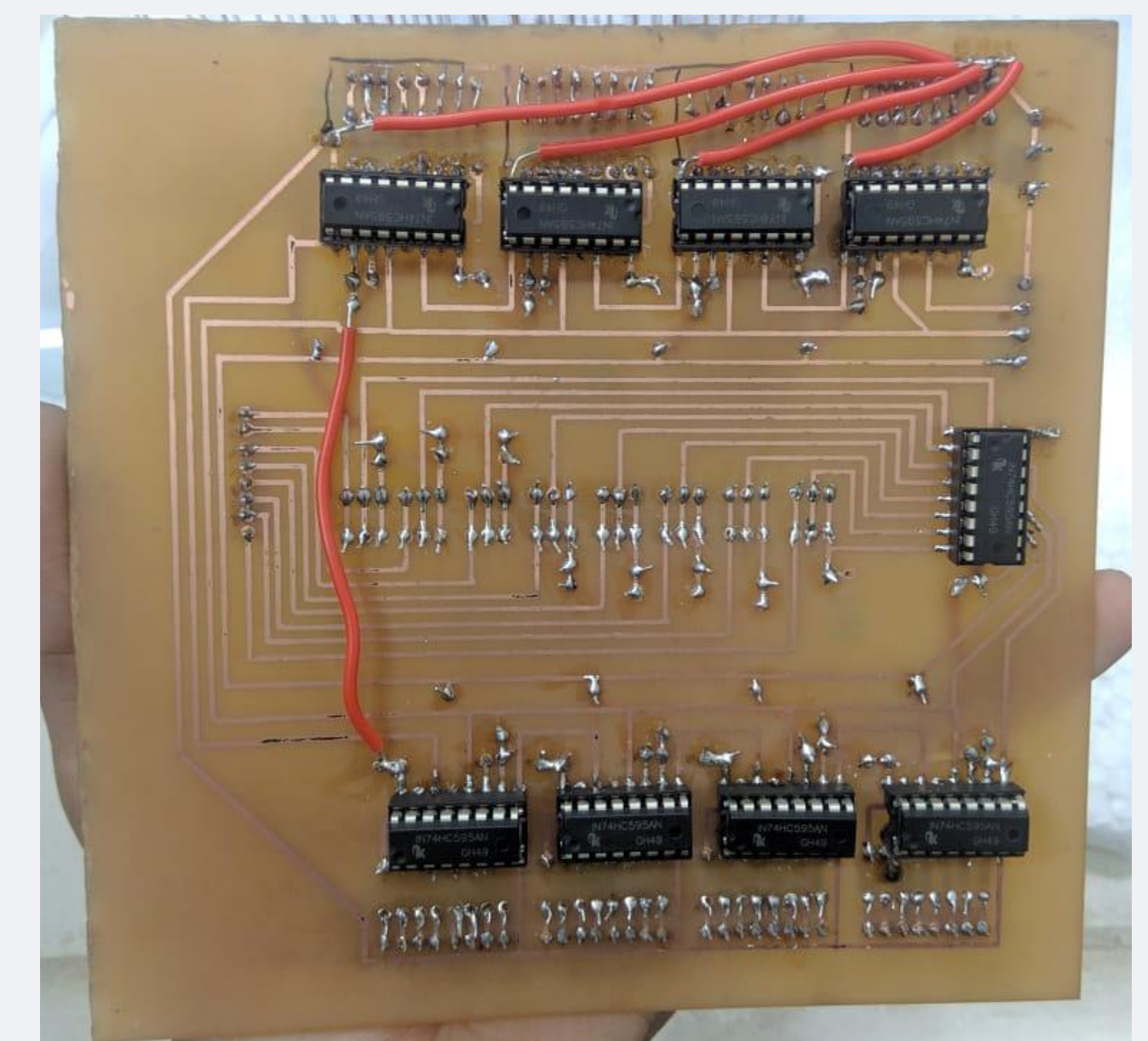

PCB Diagram of Circuit

LINK OF DESIGN:
1.https://easyeda.com/editor#id=|e9a73856cd3f441cb986b7d06e219e26|77b3187a1f3b420
2.https://easyeda.com/8-8-8/cube888

Making of Printed Circuit Diagram

Further Work

We want to interface our 8x8x8 LED CUBE with MATLAB to create more advanced animations like the audio visualizer (
https://www.youtube.com/watch?v=YCd7amvYW6c and
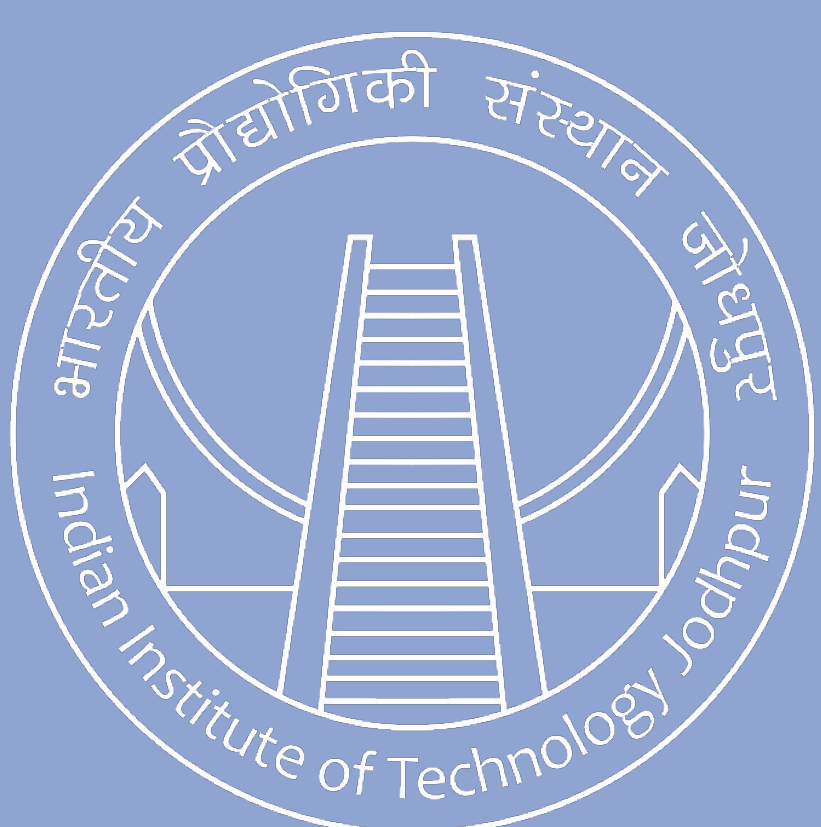https://www.youtube.com/watch?v=foRE-yohex8).

After Connecting Circuit Element to PCB.

Reference

https://www.youtube.com/watch?v=pxLvk3Zn8jo&t=0s&index=9&list=PLflO04HSTMCBaQuXKh7wDN4cEMHfADSvv

Image of Working Model

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