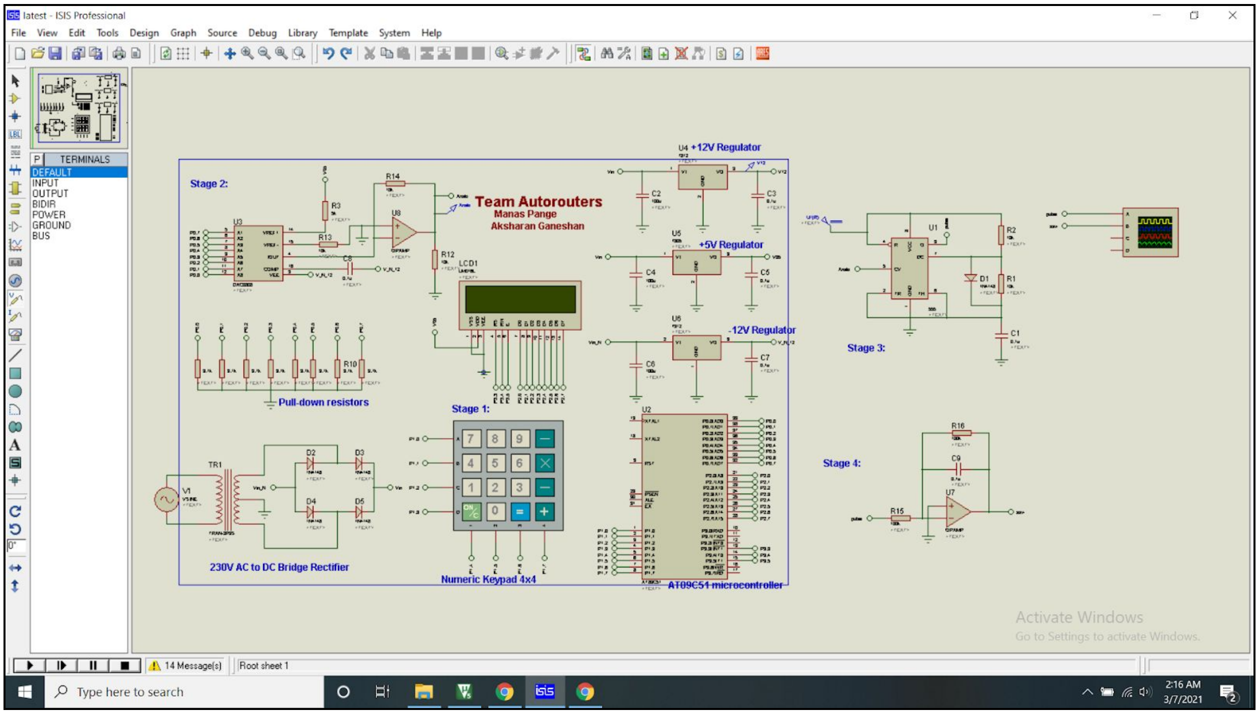
Participant 1:
Name: Manas Pange
College: KJ Somaiya College of Engineering
Branch: ETRX

Participant 2:
Name: Aksharan Ganeshan
College: KJ Somaiya College of Engineering
Branch: ETRX

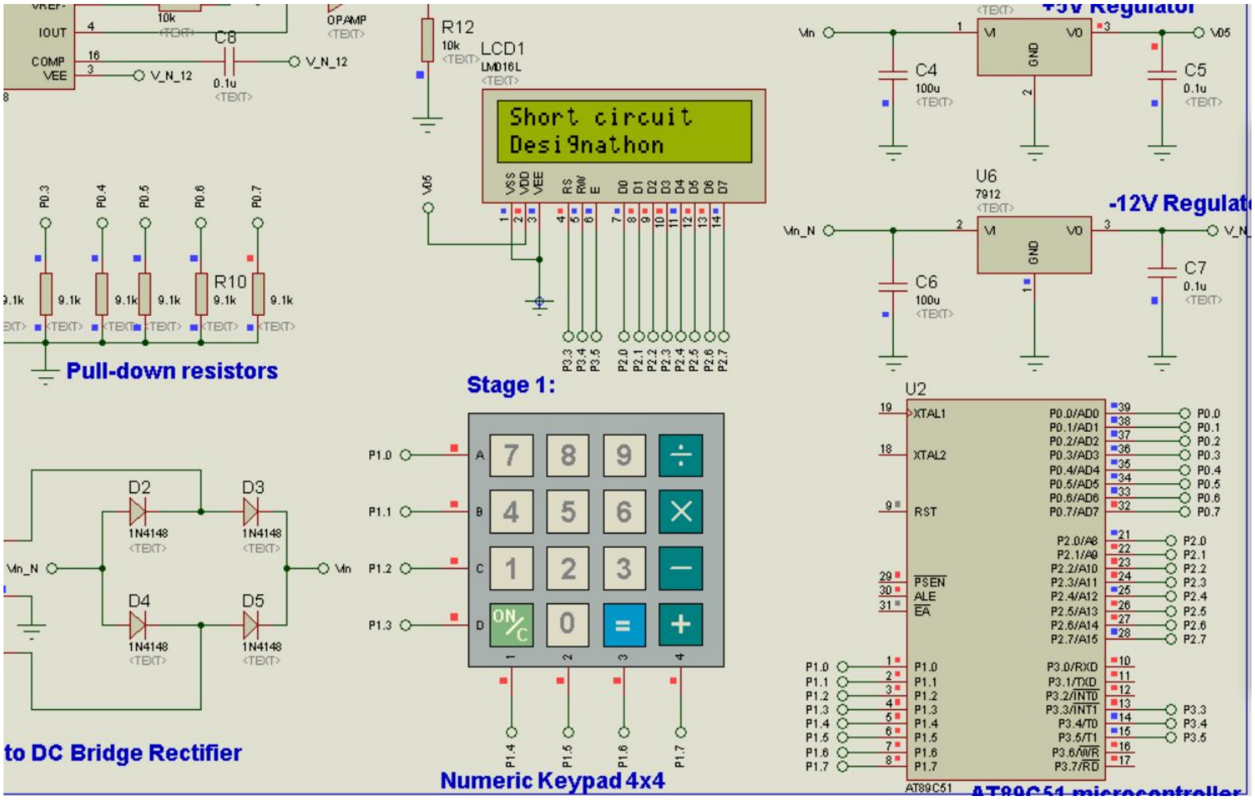
Problem Statement:

Mr. Suresh is working as a testing and measurement engineer at ‘Advanced Control Equipments’ (a Laboratory equipment provider). He has observed that the times per division knob of a Digital Oscilloscope is not functioning properly, and needs to be re-designed. The following is the block diagrammatic representation of Saw-Tooth waveform generator, which may replace the non-functional part of the horizontal section of the DSO and this may help him to use the times/division knob effectively.

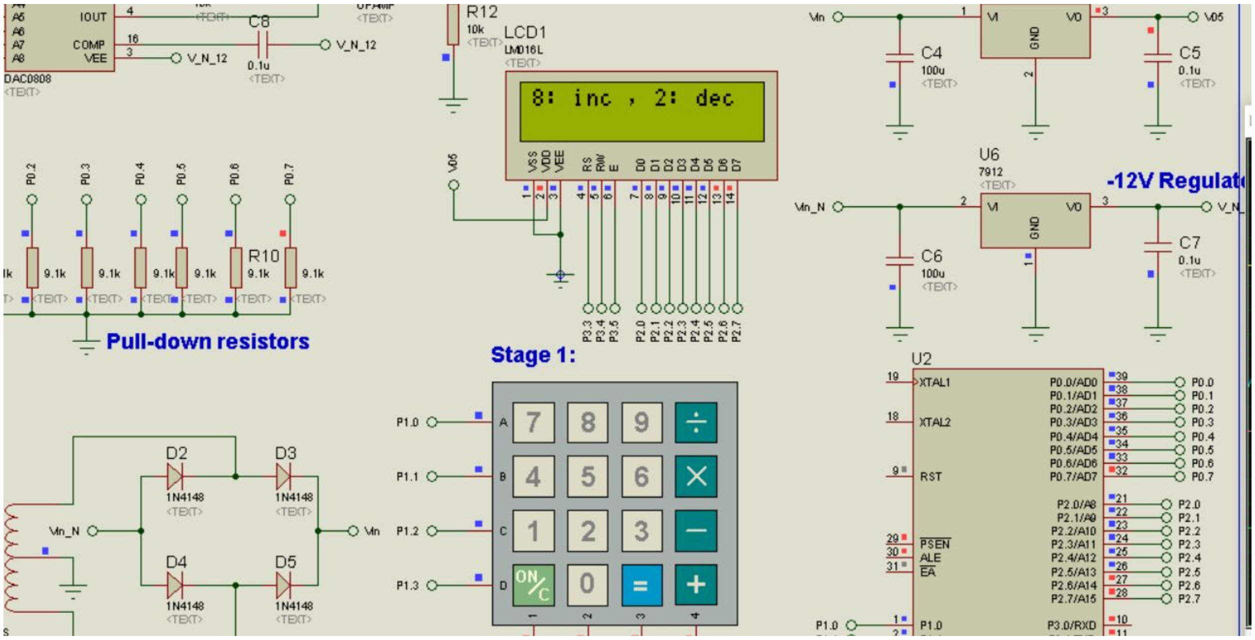
Circuit Diagram:



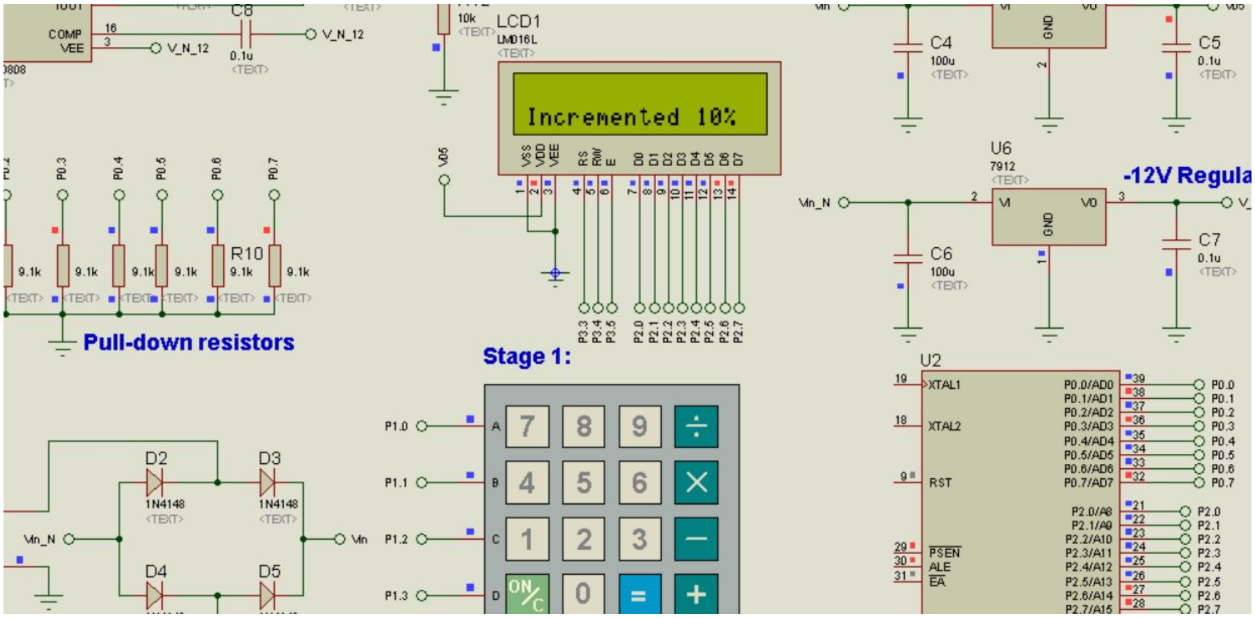
Stage 1: Control and Display:



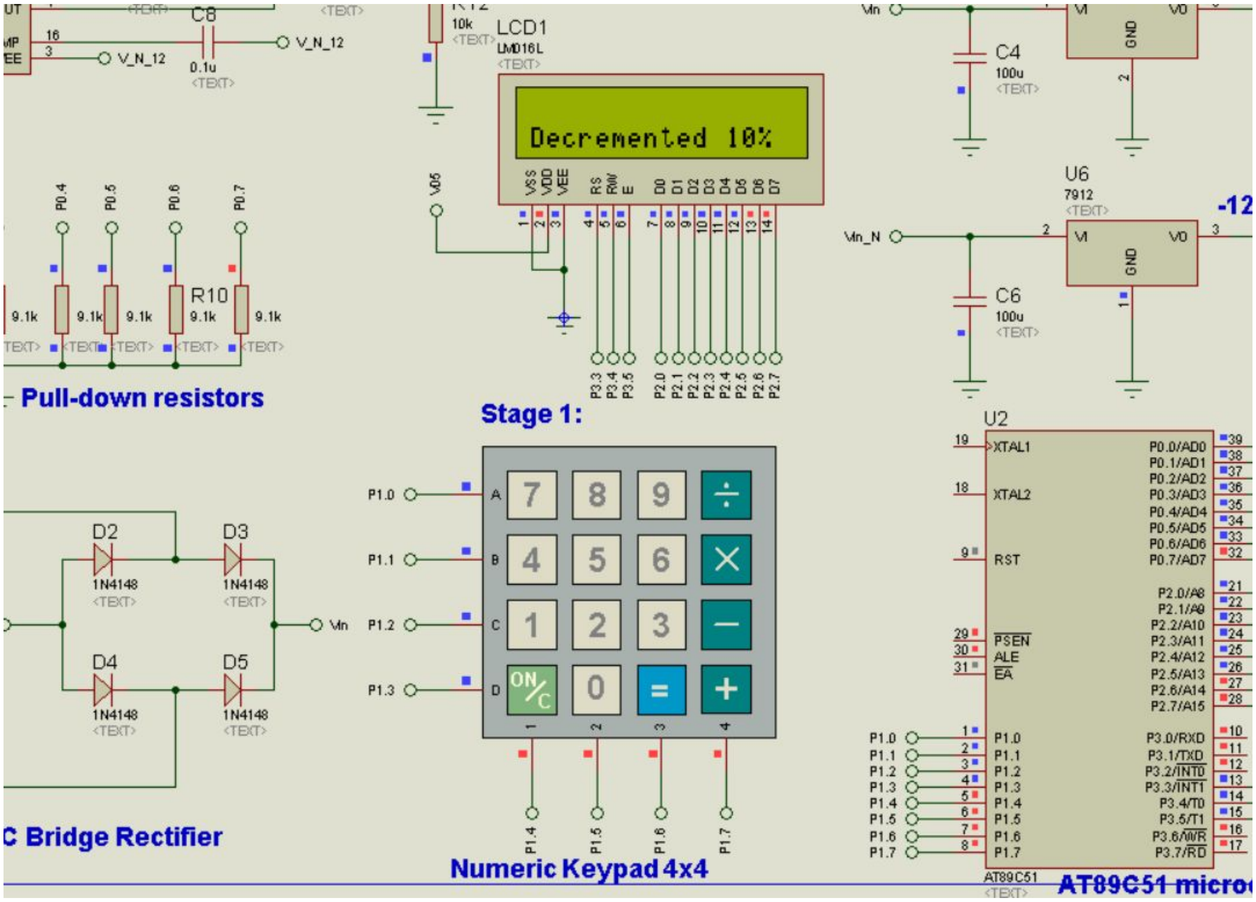
```
Short circuit
Desi9nathon
```



```
8: inc , 2: dec
```

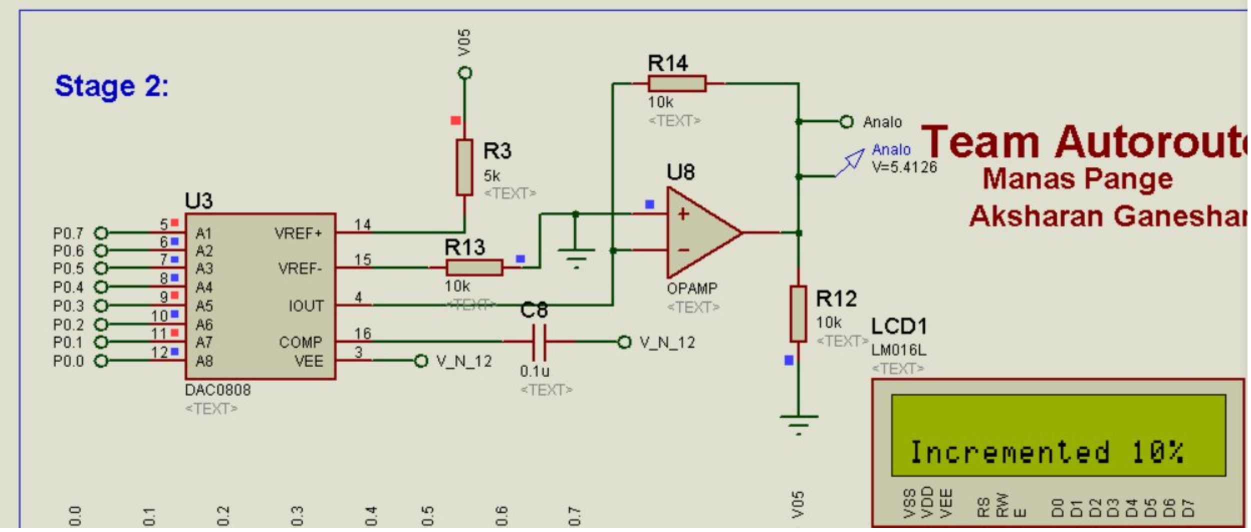


Incremented 10%

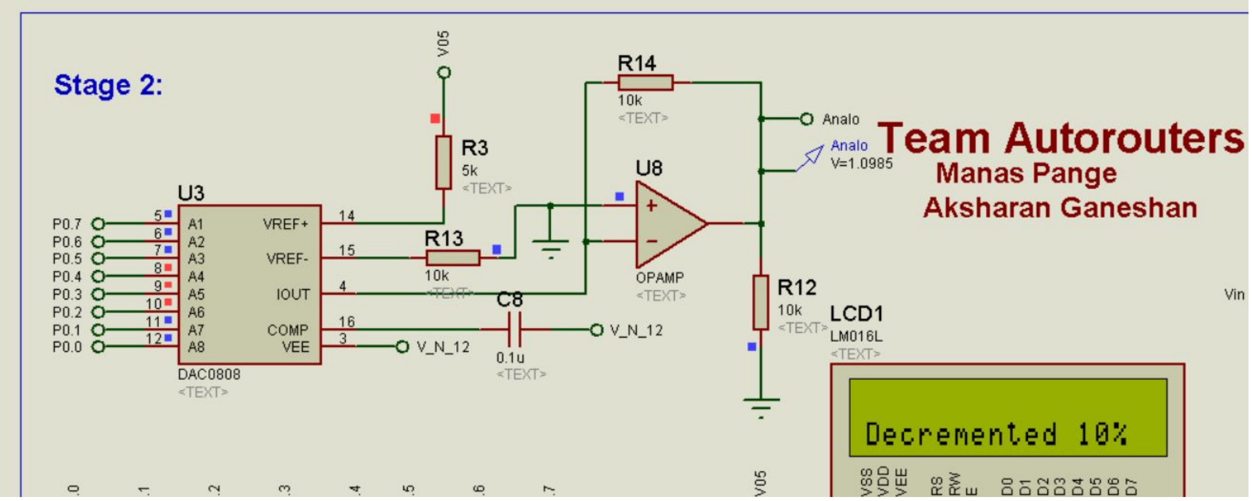


Decremented 10%

Stage 2: Digital to Analog Voltage Converter:

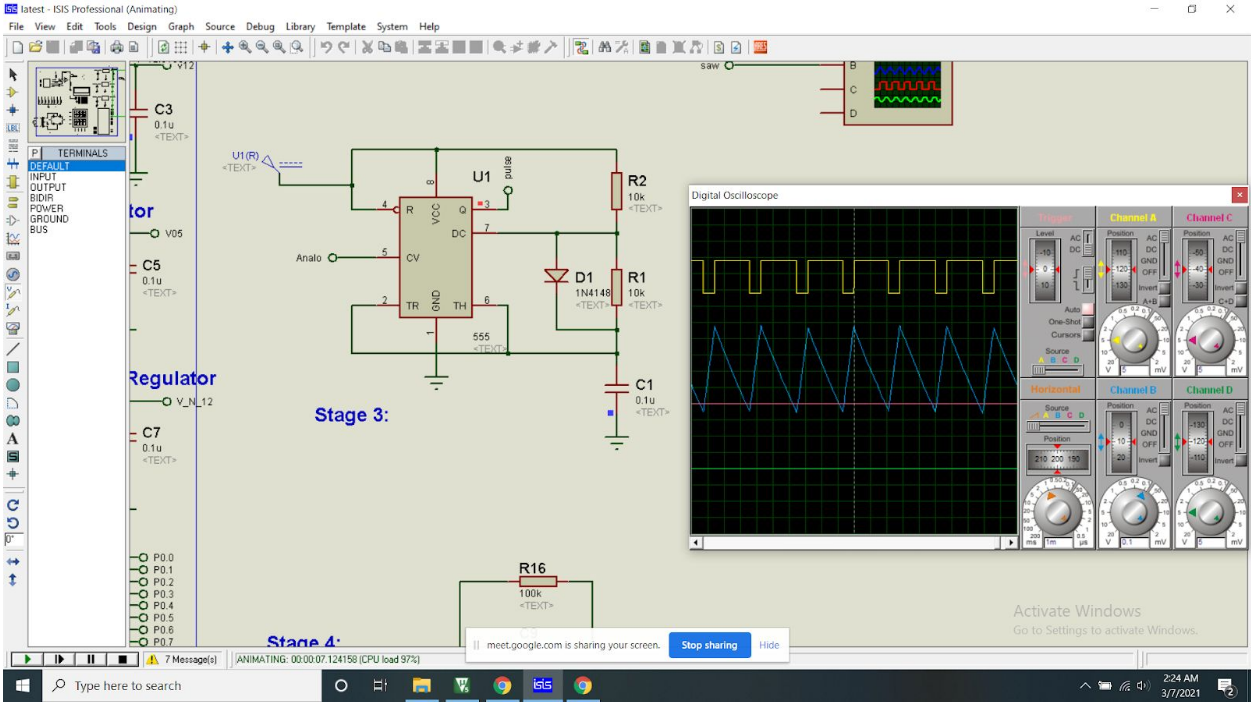


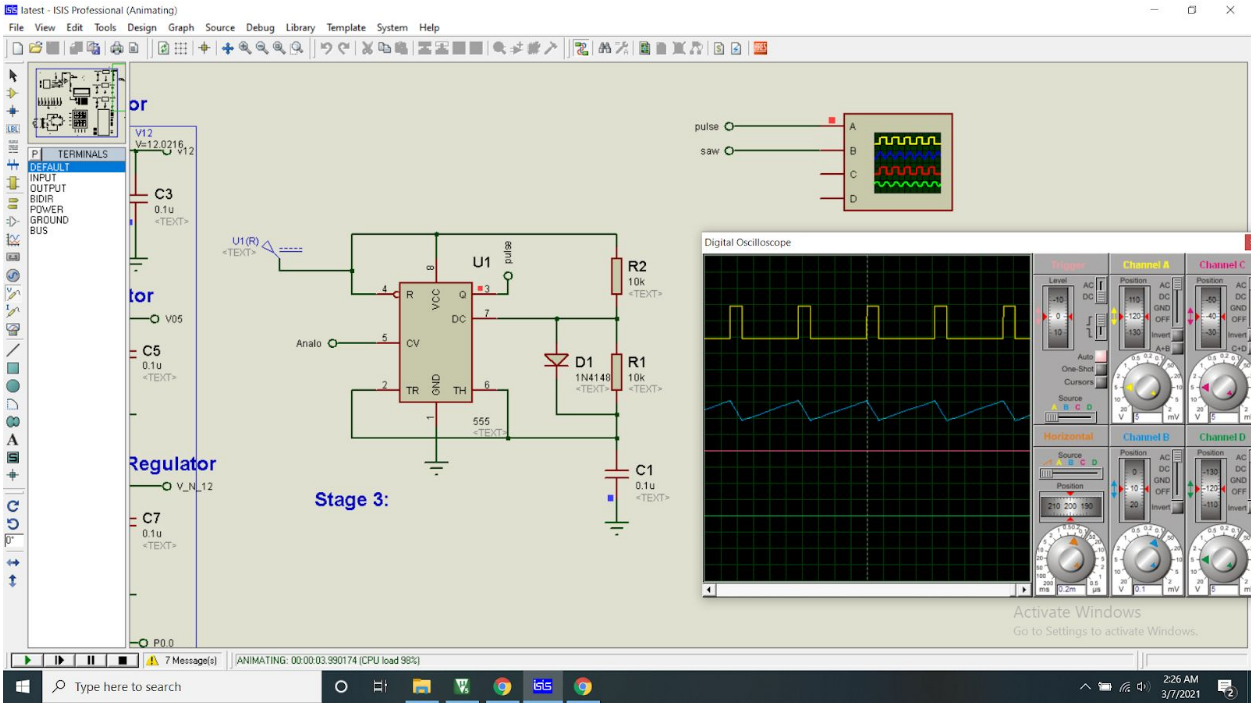
Incremented 10%



Decremented 10%

Stage 3 and Stage 4 Variable frequency pulse generator and Sawtooth Waveform Generator:



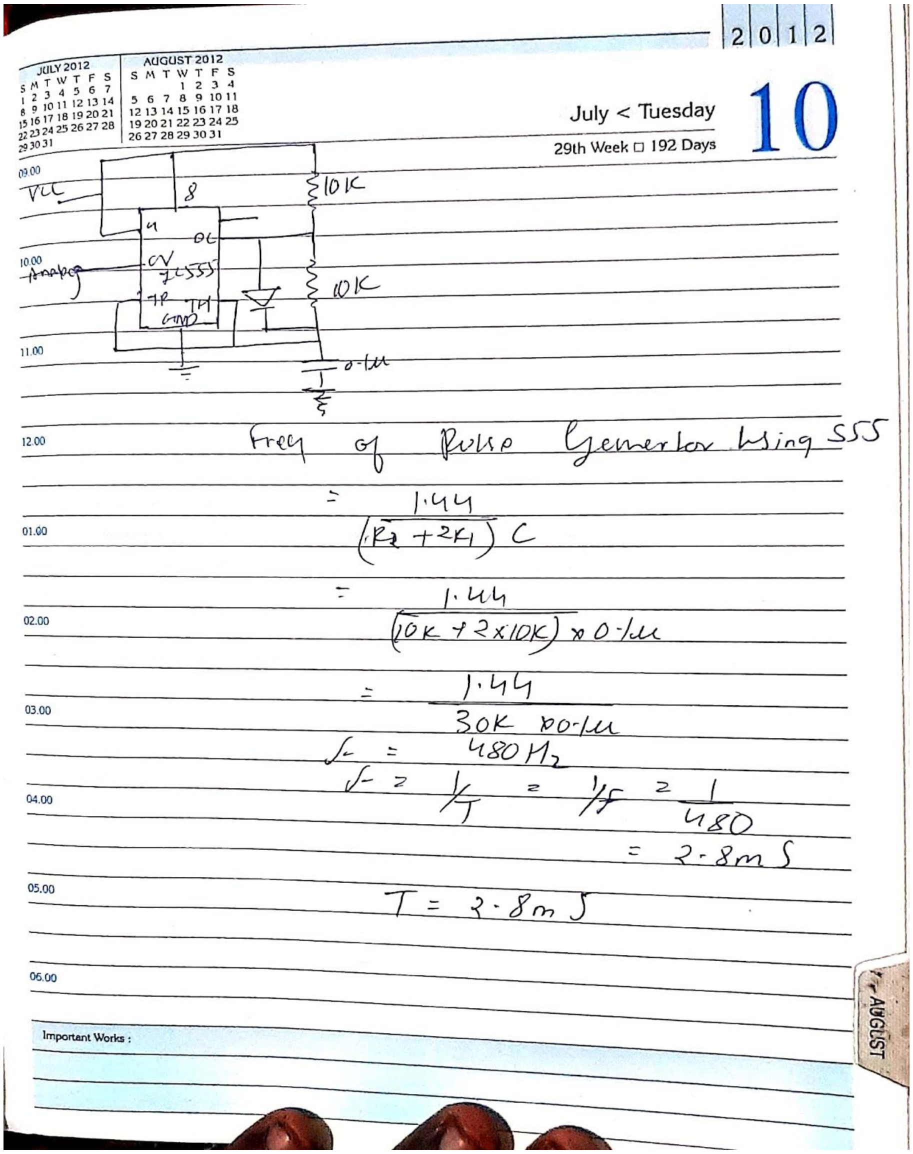


8051 Keil Code:

```
#include<reg52.h>
#include<stdio.h>
#include<string.h>
#include "LCD_8_bit.h"

#define keyport P1
#define dac P0 //Port P0 address
sbit RS             = P3^3;
sbit RW             = P3^4;
sbit ENABLE = P3^5;
unsigned char keypad[4][4] = {{'7','8','9','/'},

        {'4','5','6','x'},

        {'1','2','3','-'},

        {' ','0','=','+'} };

unsigned char colloc, rowloc;


unsigned char key_detect()
{
        keyport=0xF0;
            do
            {
                keyport = 0xF0;
                colloc = keyport;
                colloc&= 0xF0;
        }while(colloc != 0xF0);
            do
            {
                do
                {
                    delay(20);
        /* 20ms key debounce time */
                    colloc = (keyport & 0xF0);      /* read status of column */
                }while(colloc == 0xF0);                         /* check for
any key press */

                delay(1);
                colloc = (keyport & 0xF0);
            }while(colloc == 0xF0);
```

```
while(1)
    {
        /* now check for rows */
            keyport= 0xFE;
    /* check for pressed key in 1st row */
            colloc = (keyport & 0xF0);
            if(colloc != 0xF0)
            {
                rowloc = 0;
                break;
            }

            keyport = 0xFD;
    /* check for pressed key in 2nd row */
            colloc = (keyport & 0xF0);
            if(colloc != 0xF0)
            {
                rowloc = 1;
                break;
            }

            keyport = 0xFB;
    /* check for pressed key in 3rd row */
            colloc = (keyport & 0xF0);
            if(colloc != 0xF0)
            {
                rowloc = 2;
                break;
            }

            keyport = 0xF7;
    /* check for pressed key in 4th row */
            colloc = (keyport & 0xF0);
            if(colloc != 0xF0)
            {
                rowloc = 3;
                break;
            }
    }

        if(colloc == 0xE0)
        {
                return(keypad[rowloc][0]);
        }
        else if(colloc == 0xD0)
        {
            return(keypad[rowloc][1]);
        }
        else if(colloc == 0xB0)
        {
            return(keypad[rowloc][2]);
        }
        else
        {
            return(keypad[rowloc][3]);
        }
}


int main(void)
{
int dacval = 128;
    dac = dacval;
    LCD_Init();
    LCD_String_xy(1,0,"Short circuit");
    LCD_String_xy(2,0,"Designathon");
delay(100);
LCD_Command(0x01);
    LCD_String_xy(1,0,"8: inc , 2: dec");

    while(1){
        LCD_Command(0xc0);
        if(key_detect()== '8'){
                LCD_Command(0x01);
            LCD_String_xy(2,0,"Incremented 10%");
            dacval += 10 ;
        }
        else if(key_detect()== '2'){
                LCD_Command(0x01);
            LCD_String_xy(2,0,"Decremented 10%");
            dacval -= 10;
        }
        else{
LCD_String_xy(2,0,"Short circuit");
    }
        if(dacval >255) dacval = 0;
dac = dacval;
}}
```

Calculations:


2012
JULY 2012
AUGUST 2012
July < Tuesday
10
29th Week □ 192 Days
09.00
VCC
8
10K
4
DC
10.00
Analog
CV
ICL555
TR
TH
GND
10K
11.00
0.1µ
12.00
01.00
02.00
03.00
04.00
05.00
06.00
Important Works :
AUGUST

Freq of Pulse Generator using 555

$$= \frac{1.44}{(R_2 + 2R_1)\,C}$$

$$= \frac{1.44}{(10K + 2 \times 10K) \times 0.1\mu}$$

$$= \frac{1.44}{30K \times 0.1\mu}$$

$$f = 480\,Hz$$

$$f = 1/T = 1/f = \frac{1}{480}$$

$$= 2.8\,mS$$

$$T = 2.8\,mS$$

Learnings:

- Interfacing of DAC with 8051
- Designing AC to DC Converters
- Using dual rail power supplies using 7812 and 7912
- Opamp linear applications
- Interfacing of 4x4 Keypad with 8051
- Interfacing of 16x2 LCD Display with 8051
- 555 Pulse generator
- Opamp as integrators
- Simulation software like Proteus and Keil
- Troubleshooting and Debugging
- Teamwork and Time management