Experiment no. 4

AIM: To interface LCD using 8051 microcontroller and displaying characters Name and Roll no.

Theory: It is very important to keep a track of the working of almost all the automated and semi-automated devices, be it a washing machine, an autonomous robot or anything else. This is achieved by displaying their status on a small display module. LCD (Liquid Crystal Display) screen is such a display module and a 16x2 LCD module is very commonly used. These modules are replacing seven segments and other multi segment LEDs for these purposes.
The reasons being: LCDs are economical, easily programmable, have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. LCD can be easily interfaced with a microcontroller to display a message or status of a device. This topic explains the basics of a 16x2 LCD and how it can be interfaced with AT89C51to display a character. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers.

1. **Command/Instruction Register**- stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing, clearing the screen, setting the cursor position, controlling display etc.

2. **Data Register**- stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pin-out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

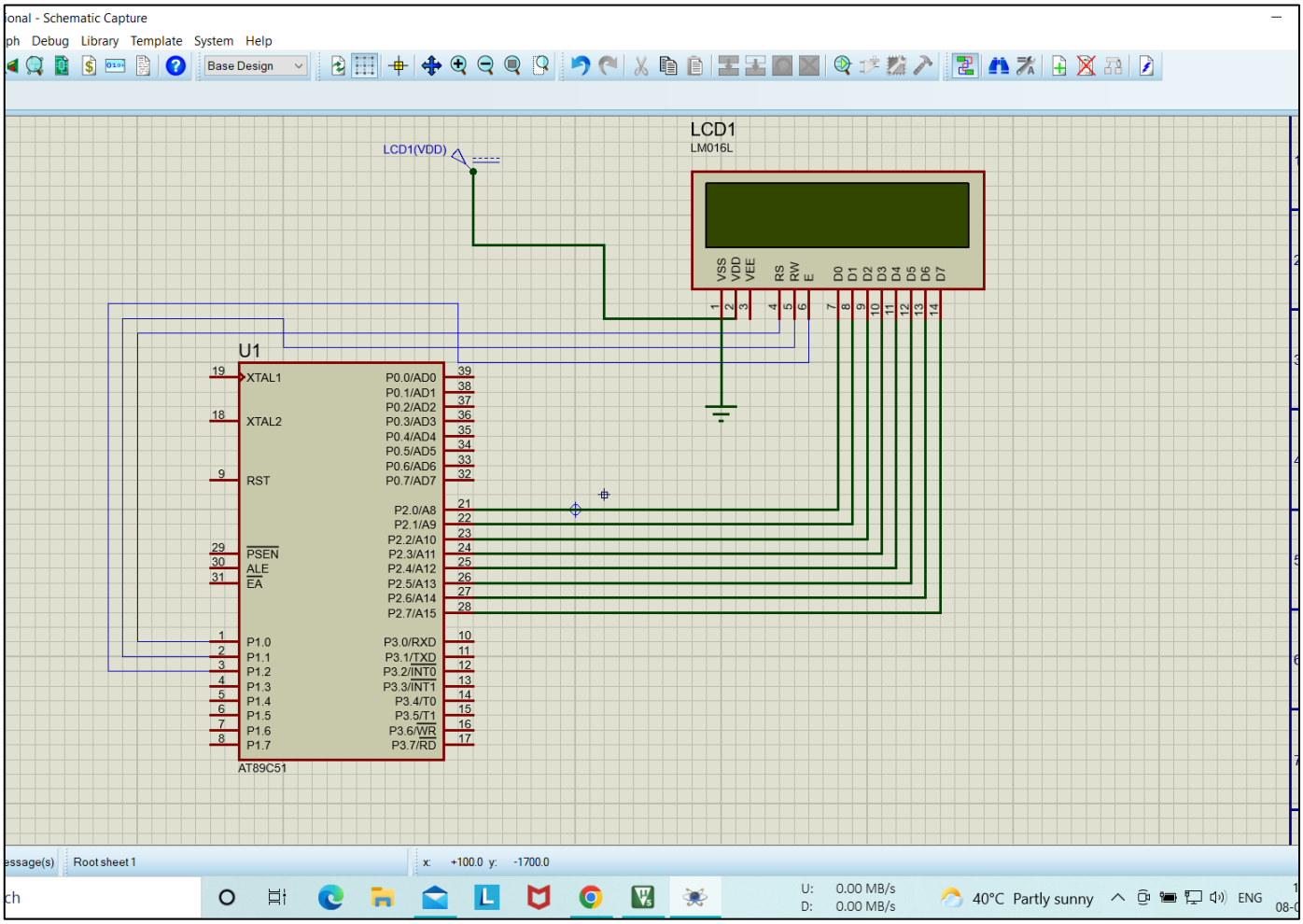
Program:

```
#include <reg51.h>
sbit rs=P1^0;
```

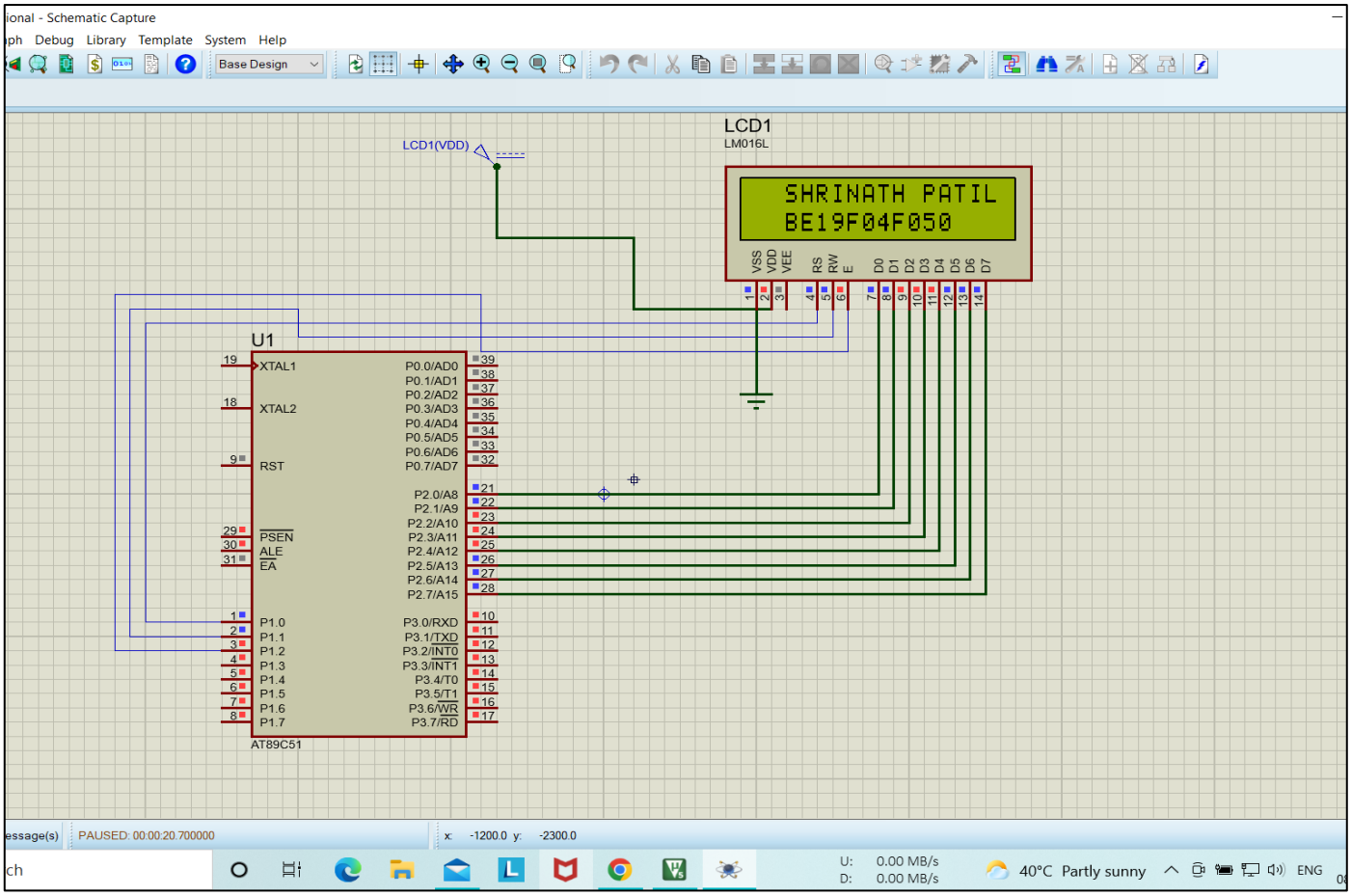
```
sbit rw=P1^1;
sbit e= P1^2;
void delay(unsigned int);
void cmd(unsigned char);
void dat(unsigned char);

void main(void)
{
unsigned char ch[]="SHRINATH PATIL";
        unsigned char ch1[]="BE19F04F050";
unsigned int i,j,k;

cmd(0x38);
cmd(0x01);
cmd(0x0c);
cmd(0x83);
cmd(0x06);


for(i=0;ch[i]!='\0';i++)
   dat(ch[i]);

cmd(0xc3);
for(j=0;ch1[j]!='\0';j++)
{
dat(ch1[j]);
  }
while(1){
for(k=0;k<16;k++)
{
cmd(0x1c);
}
}
}
void delay(unsigned int t)
{
unsigned int i,j;
e=1;
for(i=0;i<t;i++)
for(j=0;j<1275;j++);
e=0;
}

void cmd(unsigned char ch)
{

rs=0;
rw=0;
P2=ch;
delay(20);
}
void dat(unsigned char ch)
{

rs=1;
```

```
rw=0;
P2=ch;
delay(20);
}
```

Proteus Circuit:



Proteus output:



Conclusion:

Thus, we have performed LCD interfacing and displayed the message name and roll no. successfully.