CSE 316: Microprocessors, Microcontrollers, and Embedded Systems Sessional

Experiment No : 03

Name of the Experiment : Basic use of ADC and LCD module with ATMEGA 32.

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Level-Term : 3-1

Section : A1

Group No : 04

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Objective :

The objective of this experiment is to understand how to incorporate LCD and Atmega 32 and to know how ADC works.

Required Apparatus/Software :

- ATmega32
- LCD module
- USBASP programmer
- Trainer Board
- Wires
- Avr Studio
- Extreme Burner
- Potentiometer

Operational Principle :

A 16x2 LCD module is a display device which has two rows and can display 16 characters in each row.It can be interfaced with the Atmega 32 in 4 bit or 8 bit mode.In the lab ,it was instructed to use 4 bit mode.In the 4 bit mode ,there is only 4 data lines i.e. pin D4-D7.We do not need to use crystal. The connections of VSS, VDD, VEE, and D0-D3 are also not needed.To show varying voltages in the LCD module,a potentiometer needs to be used.The reference voltage is supplied through AVCC or AREF.

Procedure :

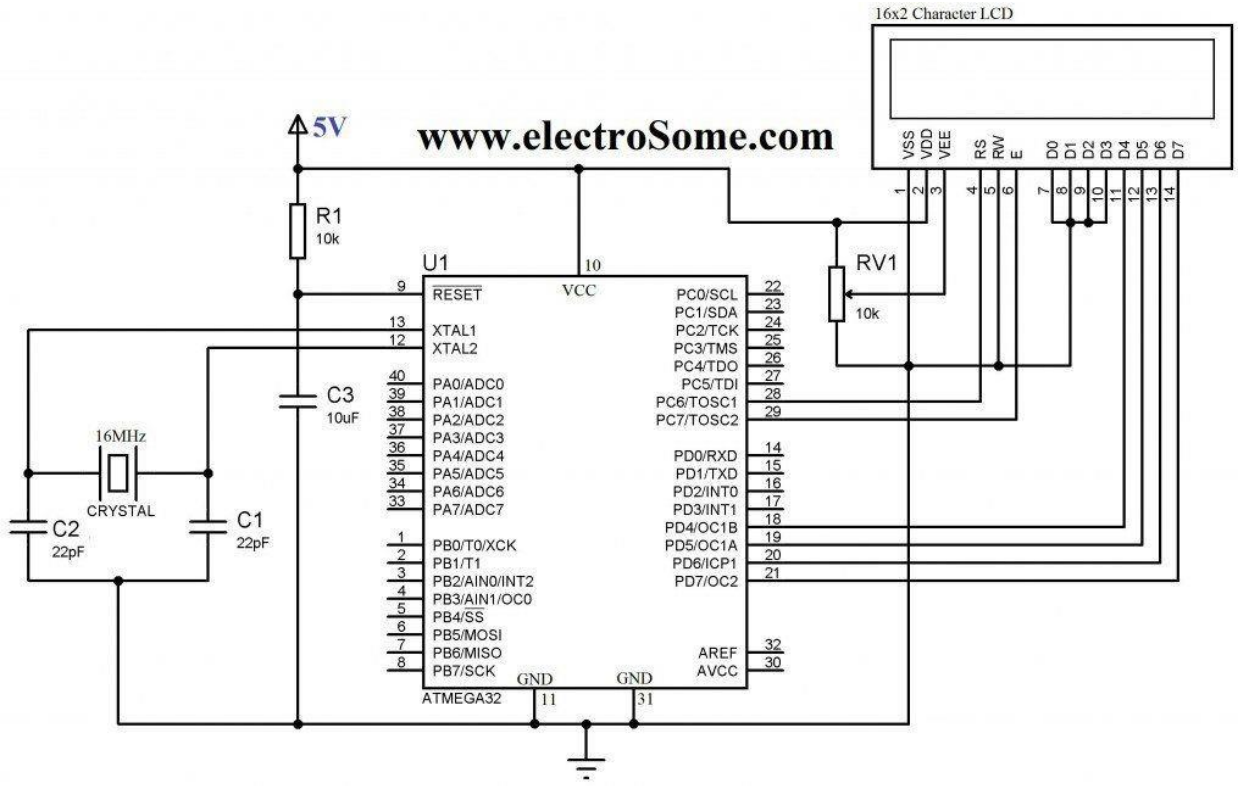
1.We wrote the code in Atmel Studio to show “Voltage” and a float value like “2.345” burnt the code in Atmega 32 properly
2.We connected the pins of LCD module and Atmega 32 following the circuit in the experiment sheet.
5.We used 4V as reference voltage using AREF.
6.After configuring the whole circuit diagram ,we successfully displayed the strings.

Detailed Configuration :

In the experiment, we were instructed to use the LCD module in 4 bit mode.In 4 bit mode ,pin D4-D7 were used as data lines. In this configuration,we used AREF to pass reference voltage.The reference voltage was 4V. We connected the pins of LCD module and Atmega32 according to following table:

LCD Module Pin	ATmega32 Pin
RS	PC6
RW	GND
E	PC7
D4-D7	D4-D7
VCC	5V
GND (both)	GND

The circuit diagram we used is below:



Code :

```
/*
 * LCDVoltage.cpp
 *
 * Created: 7/21/2019
8:55:53 AM
 * Author : JP
 */

#include <avr/io.h>
#include <stdlib.h>
#include <stdio.h>

#ifndef F_CPU
```

```
#define F_CPU
1000000UL // 1 MHz
clock speed
#endif
#include <util/delay.h>

#define D4 eS_PORTD4
#define D5 eS_PORTD5
#define D6 eS_PORTD6
#define D7 eS_PORTD7
#define RS eS_PORTC6
#define EN eS_PORTC7

#include "lcd.h"

int main(void)
{
DDRD = 0xFF;
DDRC = 0xFF;

ADMUX = 0b00000011;
ADCSRA = 0b10000010;


Lcd4_Init();
Lcd4_Clear();

Lcd4_Set_Cursor(1,0);
Lcd4_Write_String("Volt
age");

while(1)
{
```

```
        ADCSRA |=
(1<<ADSC);
        while(ADCSRA &
(1<<ADSC));

        int temp = ADCL;
        int input = ADCH;
        input = (input &
0b00000011);
        input <<= 8;
        input |= temp;

        double vin = (
input / 1024.0) * 4.0;

        char display[16];
        dtostrf(vin, 5, 3,
display);


Lcd4_Write_String(displ
ay);
}
}
```

Discussion :

The problem we faced in the lab was none of us didn't know it correctly how to configure the LCD module and Atmega32.We did the code rightly and did the simulation in PROTEUS software.It showed us correct results,but when we

implemented it in hardware ,the LCD module showed nothing.We took the LCD module as problematic and changed it.Again it didn't work right.This time we changed the ATMEGA 32 and did the configuration again.But things didn't improve.Then we realized that we were intending to use AREF but had the configuration related to AVCC.So ,we disconnected everything and started from scratch. We burnt the code in ATMEGA 32 properly and incorporate it to LCD .This time ,it showed the strings properly.