Lab Manual for Embedded System Design

Lab No. 6

Analog to Digital Conversion in Arduino & interfacing to analog Sensor

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Objectives

In this Lab Students are introduced with ADC in Arduino and interfacing analog sensor with Arduino

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LAB # 6

Analog to Digital conversion and interfacing analog sensor with Arduino.

Introduction

Analog to Digital Conversion (ADC) in Arduino:

ADC is used to convert analog signals in to digital and then digital signal is provided to microcontroller for further processing. Arduino Uno uses amega 328p as microcontroller, it has 6 built in ADC channels of 10 bit.

Arduino uses analogRead (pin) command to read analog sensor data. This commands returns values from 0 – 1023. Pin number A_0 to A_5 on Arduino Uno board can be used as ADC.

LM35 Temperature Sensor:

LM35 is a temperature sensor that is employed to measure the temperature. It has three terminal Vcc, Output, and Ground as shown in the figure 6.1 below. Range of the LM35 temperature sensor is from -55 'C to +155 'C. The output range varies by 10mV to each fall and rise in temperature.
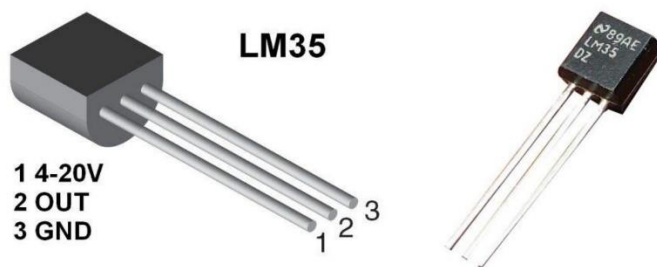
The pin configuration if shown as in Fig. 6.1


1 4-20V
2 OUT
3 GND

Fig. 6.1: LM35 Temperature Sensor

Time Boxing

Activity Name	Activity Time	Total Time
Login Systems + Setting up Proteus & Arduino Environment	3 mints + 5 mints	8 mints
Walk through Theory & Tasks	60 mints	60 mints
Implement Tasks	80 mints	80 mints
Evaluation Time	30 mints	30 mints
	Total Duration	178 mints

Objectives

In this Lab Students are introduced with ADC and interfacing of Temperature sensor with Arduino Uno

Lab Tasks/Practical Work

1. Write a program to interface potentiometer with analog pin of Arduino Uno to read analog values and display it on LCD
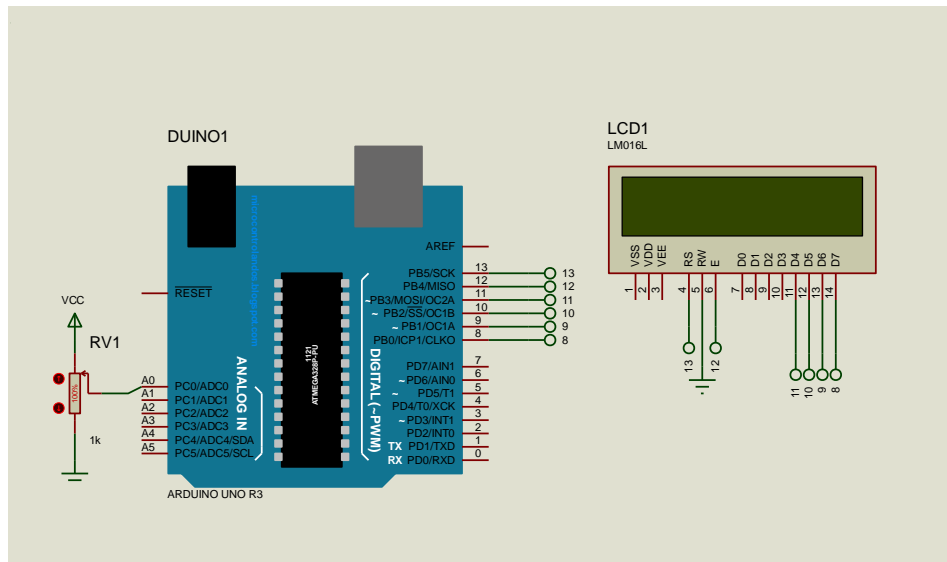
Code:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(13, 12, 11, 10, 9,8 );
void setup()
{
lcd.begin(16, 2);
 }
void loop()
{
  float voltage = analogRead(A0);
voltage = ((voltage*5)/1023);
lcd.setCursor(0, 0);
lcd.print("analog val = " );
lcd.setCursor(12, 0);
lcd.print(voltage);
delay(200);

}}
```

2. Write a sketch to interface Arduino with the Temperature Sensor (LM35). The value of the Temperature should be displayed on the LCD
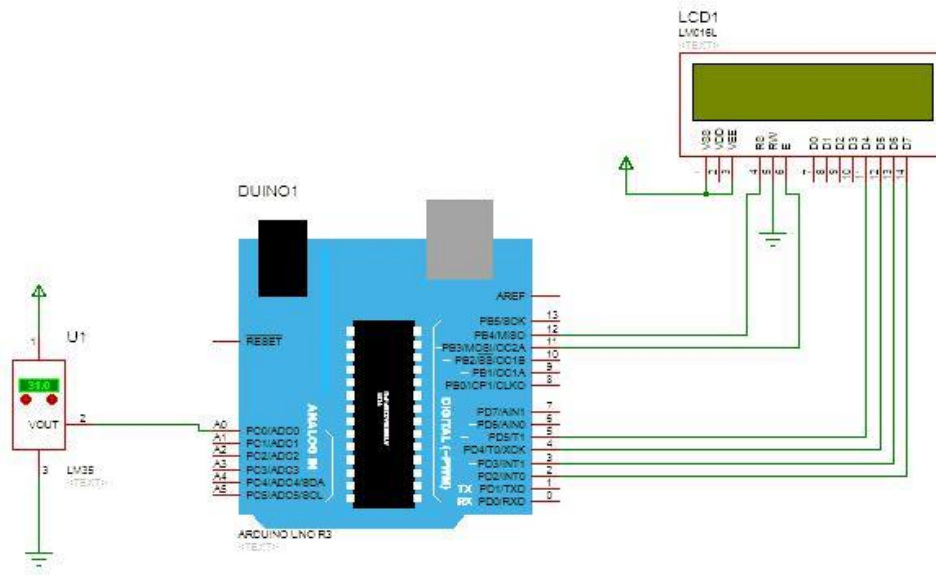
Code:

int tempPin=A0;
float temp;

#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

void setup()
{
      lcd.begin (16, 2);   *// Activating both Rows of LCD.*
      lcd.print("Temperature=");
}

void loop()
{
      temp = analogRead (tempPin);   *// Reading the Temperature.*
      temp = temp*0.48828125;   *// Conversion Factor.*
      delay (1000);
      lcd.setCursor (0, 1);   *// Selecting the LCD Cursor to 1st Line*
      lcd.print(temp);
      lcd.print(" Centigrade");
}