Relays we used here are Heater and Fan; they are used for adjusting the obtained temperature with the desired temperature value.

The display section, through the IC LM020L, that displays temperature. It is the main observable part of this whole system.

2.2 Overall Circuit Diagram

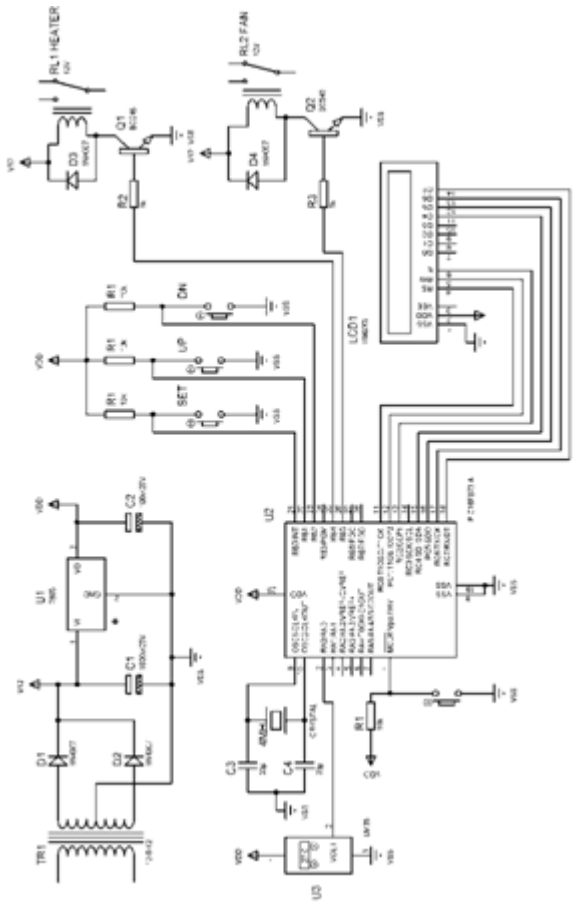

Figure 2: Circuit Diagram for the controller

2.3 Overall Circuit Diagram Working

The circuit shows microcontroller based temperature PID controller using temperature sensor.Microcontroller PIC 16F873A is the heart of the circuit. It is available inRISC architecture. The PIC 16F873A is a mid-range 8-bit CPU optimized for ControlApplications. It has 35 instructions on chip flash program memory.

LM35 used as the temperature sensor. It sense the current temperature of a closed loop and converts into corresponding voltage as it is a transducer. It is connected to pin 2 (RA0/AN0) of microcontroller. The microcontroller circuit is connected with reset circuit and crystal oscillator circuit. Crystal oscillator is the one used to generate the pulses to the microcontroller and it is also called as the heart of microcontroller. Here we have used 4 MHz crystal which generates pulses. It offers the highest precision (exactness/accuracy) and stability.

Even the microcontroller has an internal RC oscillator with a maximum frequency of 4 MHz, noise affect it easily. Because of increasing of aging of oscillator, resonant frequency varies and cannot get the fixed frequency. So we use crystal oscillator externally for accuracy.

To set up the desired temperature value, we use the micro keys such as SET, UP, DOWN. And also the tolerance value is set in the firmware using embedded C language.

According to the comparison of desired temperature (here we say as 'Set point') with the current temperature, the relay - Heater or Fan is worked.

Case I:
If the current temperature is greater than desired temperature (including tolerance) then turn off the heater and turn on the fan.

Case II:
If the current temperature is less than the desired temperature (including tolerance), then turn on the heater and turn off the fan.

Case III:
Else turn off both heater and fan.The relays such as heater connected to pin 25 (RB4) and fan is connected to pin 26 (RB5).

The processing of controller will display in the LCD. The current temperature as 'CT' and the set point as 'SP'can be observed on the first line of LCD. And also, the present conditions of the relays are displayed on the second line of the LCD.

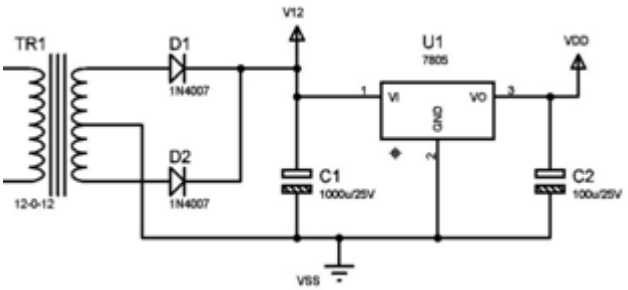

Figure 3: Circuit diagram for regulator

3. Working Principle

Transformer
The transformer will step down the power supply voltage (0 – 230 V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the center-tapped full-wave rectifier; where diodes are working in the property of one-side conduction capability.

Center tap-Rectifier
In a rectifier, a center-tapped transformer and two diodescan form a full-wave rectifier that allows both half-cycles of the AC waveform to contribute to the direct current, making it smoother than a half-wave rectifier. A center-tapped rectifier is preferred to the full bridge rectifier when the output DC current is high and the output voltage is low. The advantages of using precision rectifier are it will give peak voltage output as dc; rest of the circuits will give only RMS output.