Electric Water Heater Project

GRADUATION PROJECT

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TEAM

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MAJOR REQUIREMENTS

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1. The “Up” or “Down” buttons are used to change the required water temperature (set temperature).
2. The first “Up” or “Down” button press, enters the temperature setting mode.
3. After entering temperature setting mode, a single “Up” button press increase the set temperature by 5 degrees.
4. After entering temperature setting mode, a single “Down” button press decrease the set temperature by 5 degrees.
5. The minimum possible set temperature is 35 degrees.
6. The maximum possible set temperature is 75 degrees.
7. The “External E2PROM” should save the set temperature once set.
8. If the electric water heater is turned OFF then ON, the stored set temperature should be retrieved from the “External E2PROM”.
9. The initial set temperature is 60 degrees.

components

INPUTS

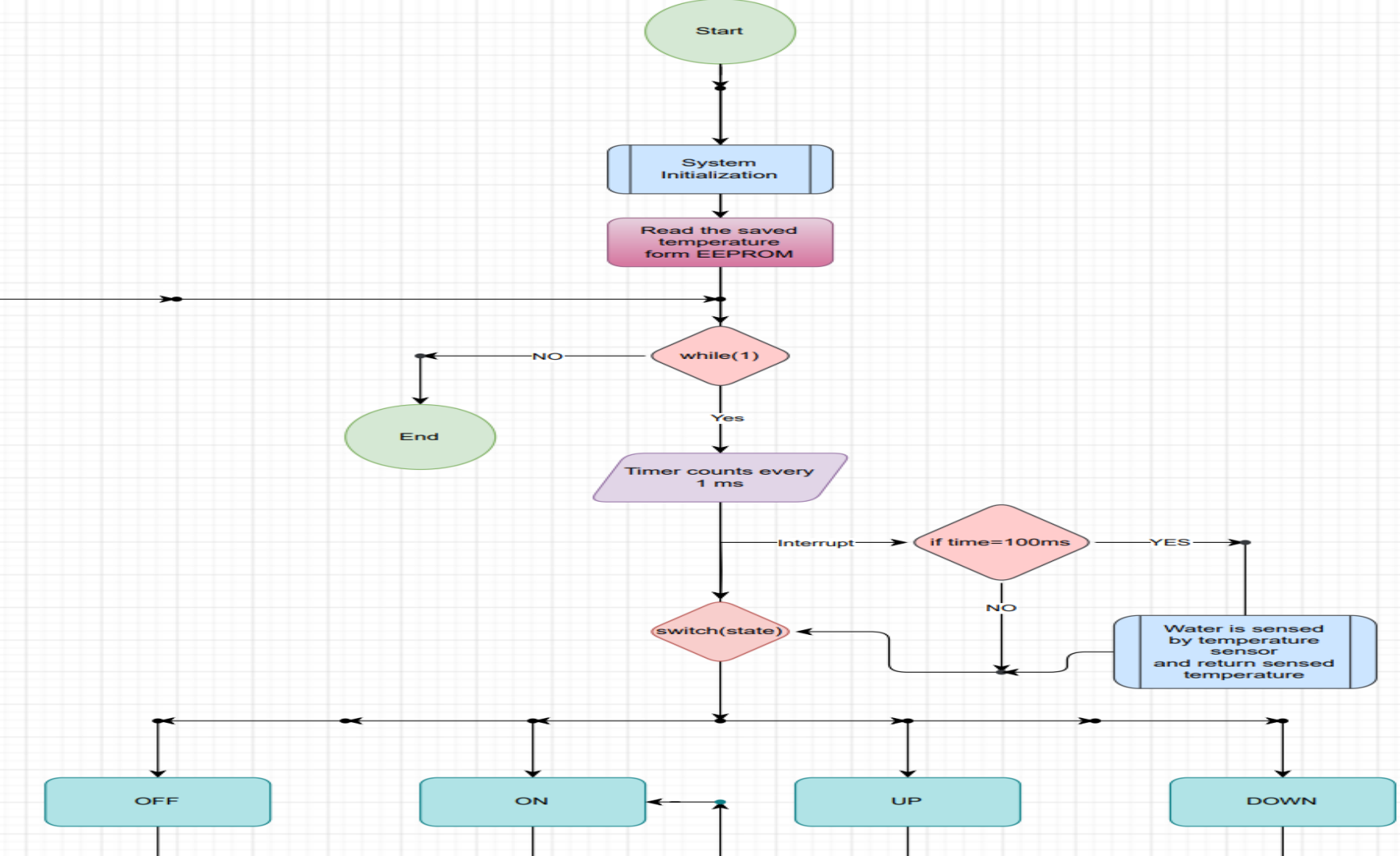
BUTTONS –
TEMPERATURE SENSOR

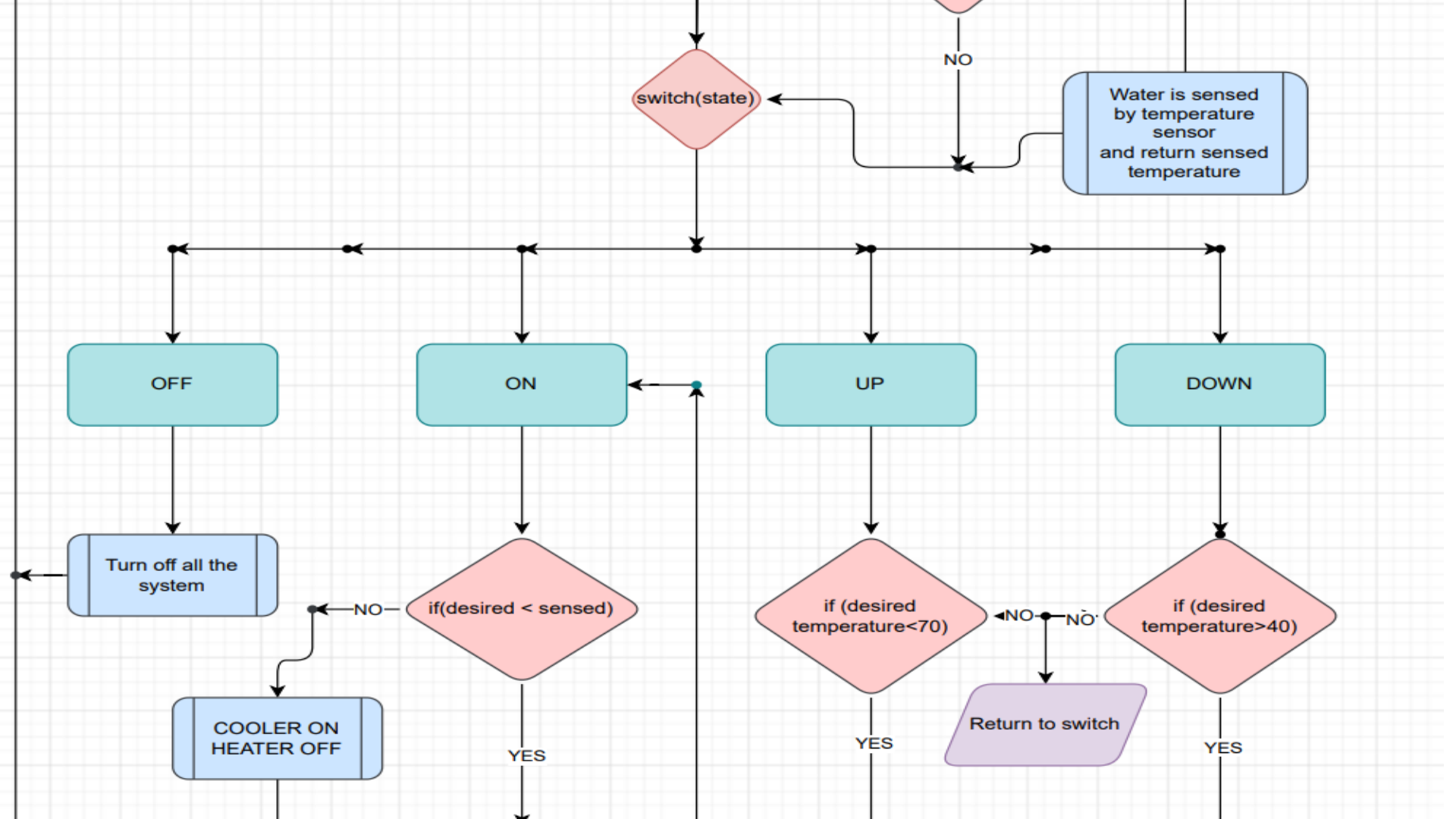
OUTPUTS

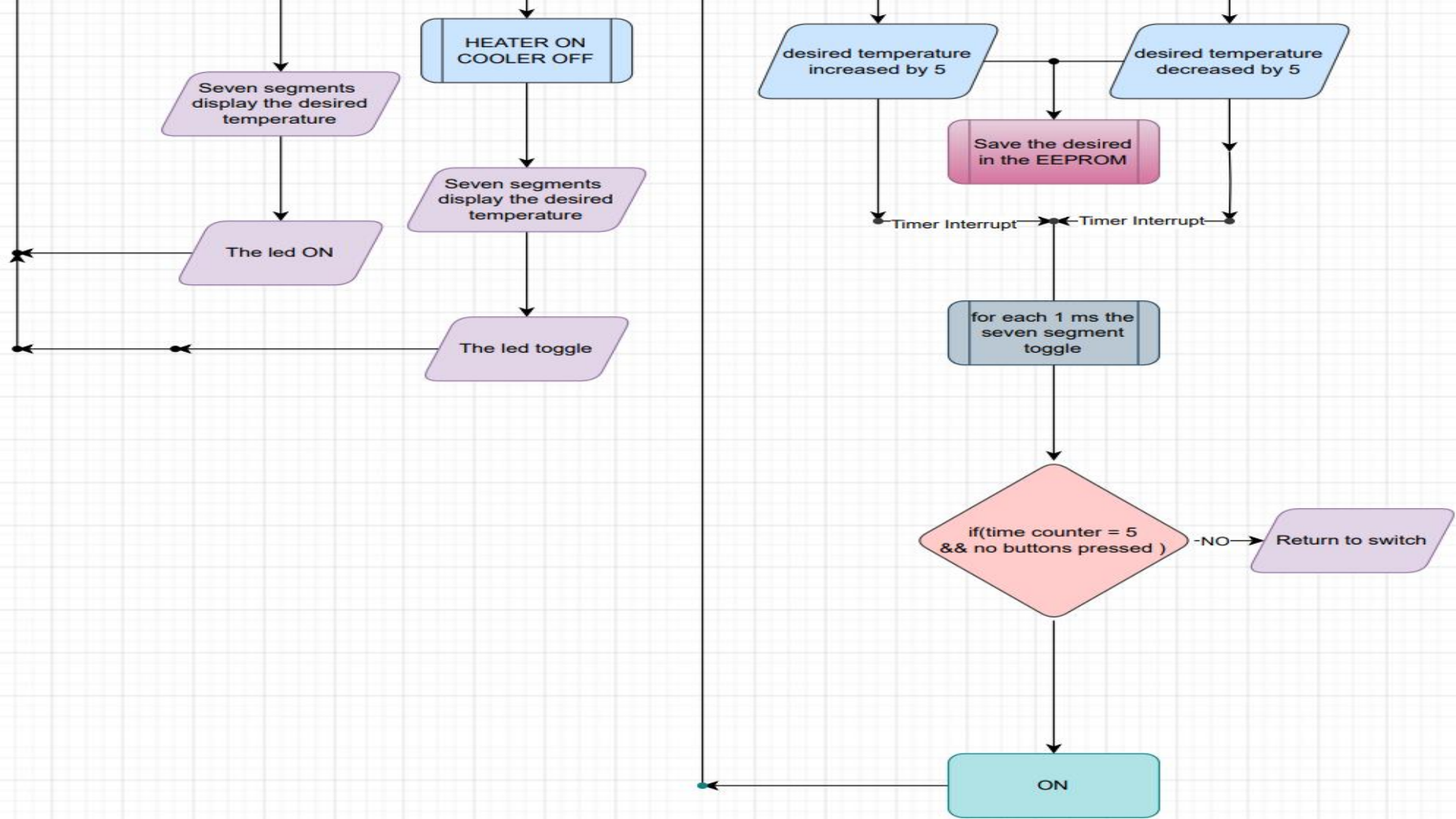
HEATER – COOLER – LED –
SEVEN SEGMENT DISPLAY

03

FLOWCHART


Start
System Initialization
Read the saved temperature form EEPROM
while(1)
NO
End
Yes
Timer counts every 1 ms
Interrupt
if time=100ms
YES
NO
switch(state)
Water is sensed by temperature sensor and return sensed temperature
OFF
ON
UP
DOWN


NO
switch(state)
Water is sensed by temperature sensor and return sensed temperature
OFF
ON
UP
DOWN
Turn off all the system
if(desired < sensed)
NO
COOLER ON HEATER OFF
YES
if (desired temperature<70)
NO
Return to switch
YES
if (desired temperature>40)
NO
YES


HEATER ON
COOLER OFF
Seven segments display the desired temperature
Seven segments display the desired temperature
The led ON
The led toggle
desired temperature increased by 5
desired temperature decreased by 5
Save the desired in the EEPROM
Timer Interrupt
Timer Interrupt
for each 1 ms the seven segment toggle
if(time counter = 5 && no buttons pressed)
NO
Return to switch
ON

04

CODE STAGES

WHAT I AM WORKING ON

01

MCAL

ADC – INTERRUPTS – TIMER – EEPROM – I2C

02

HAL

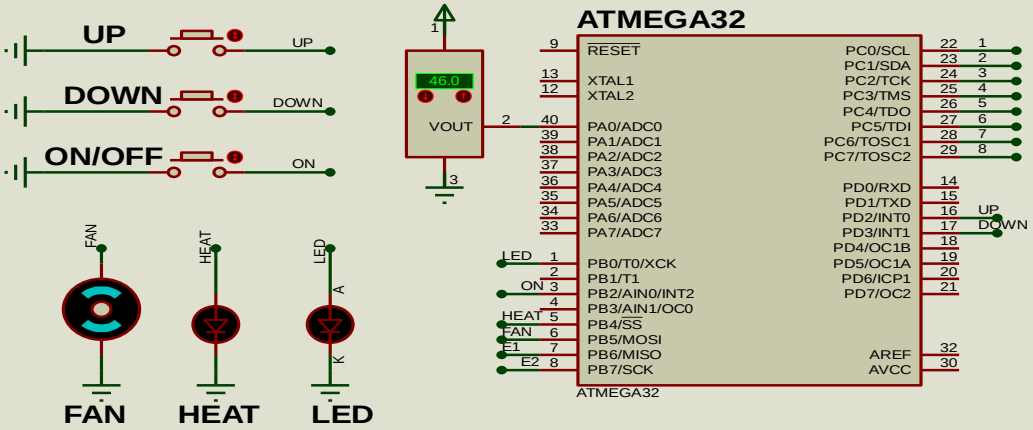
LED – HEATER – COOLER – SEVEN SEGMENT – BUTTONS – EEPROM

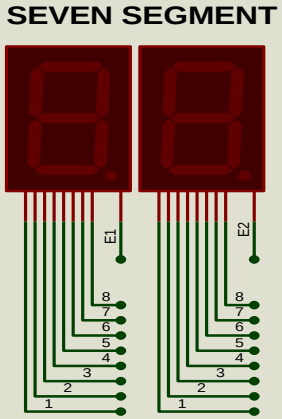
03

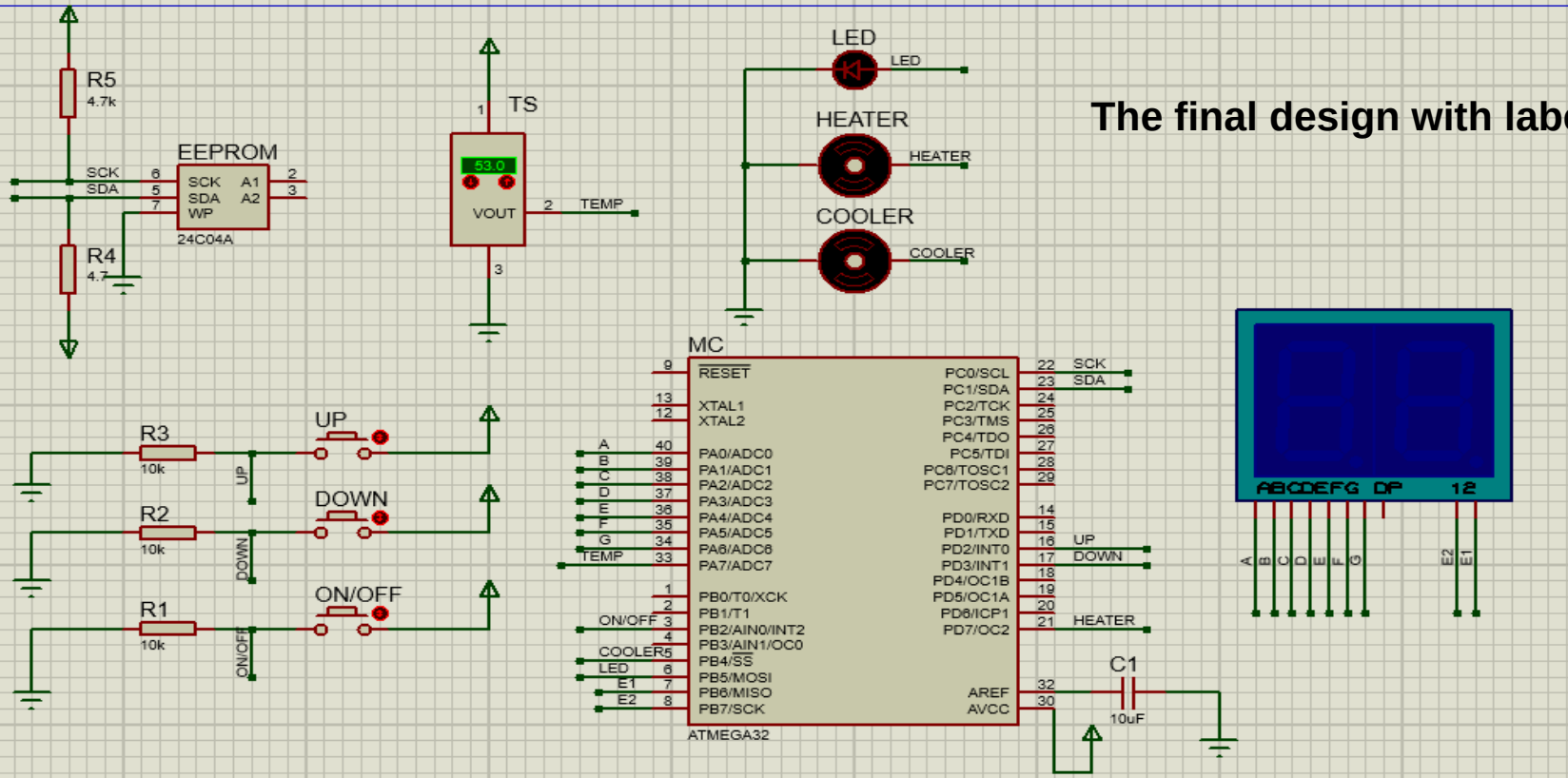
API

HANDLING THE SYSTEM

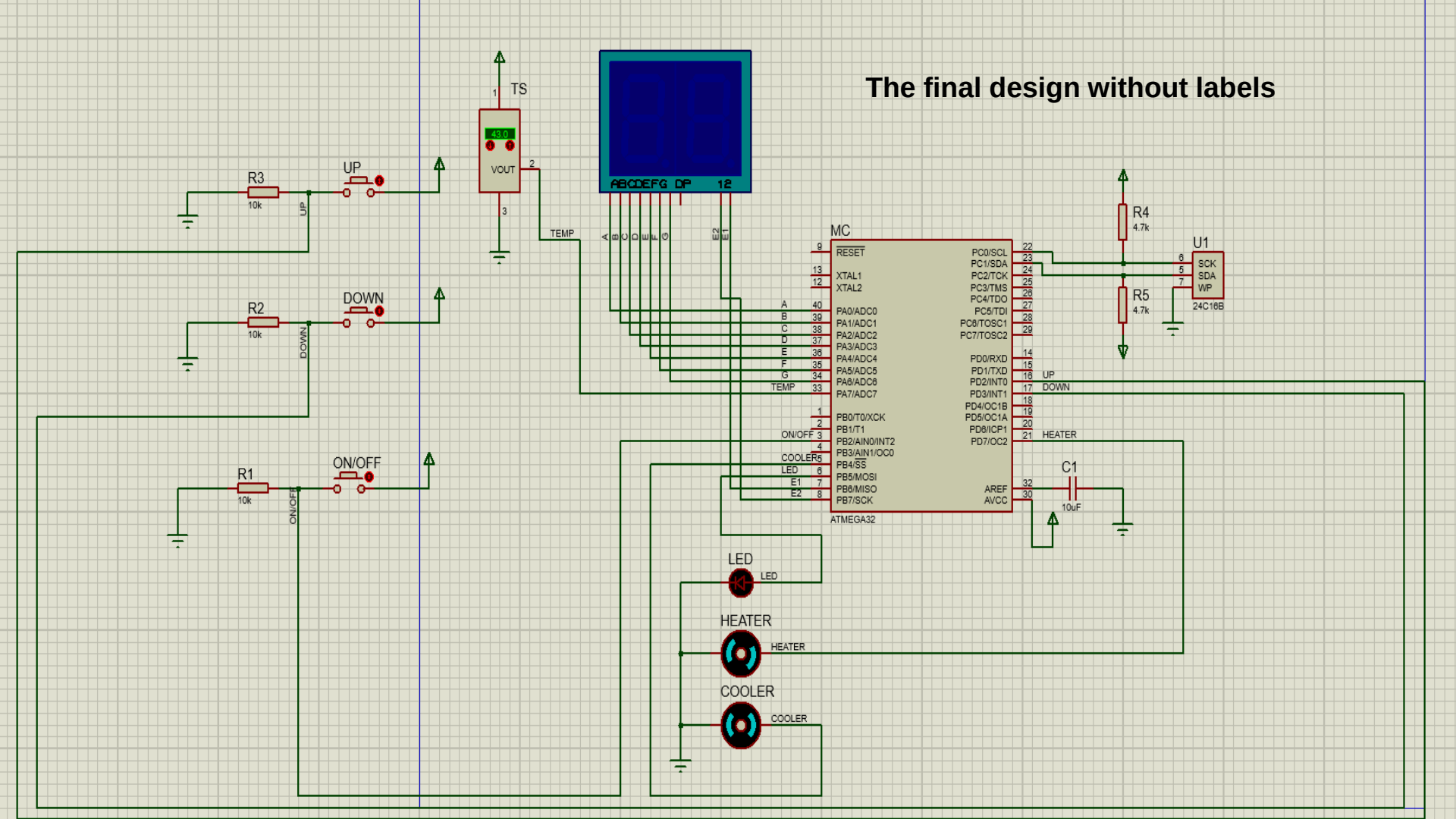
The first design







The final design with labels


The final design without labels
TS
43.0
VOUT
TEMP
ABCDEFG DP
12
E2
E1
MC
RESET
XTAL1
XTAL2
PA0/ADC0
PA1/ADC1
PA2/ADC2
PA3/ADC3
PA4/ADC4
PA5/ADC5
PA6/ADC6
PA7/ADC7
PB0/T0/XCK
PB1/T1
PB2/AIN0/INT2
PB3/AIN1/OC0
PB4/SS
PB5/MOSI
PB6/MISO
PB7/SCK
ATMEGA32
PC0/SCL
PC1/SDA
PC2/TCK
PC3/TMS
PC4/TDO
PC5/TDI
PC6/TOSC1
PC7/TOSC2
PD0/RXD
PD1/TXD
PD2/INT0
PD3/INT1
PD4/OC1B
PD5/OC1A
PD6/ICP1
PD7/OC2
AREF
AVCC
UP
DOWN
HEATER
ON/OFF
COOLER
LED
R1
R2
R3
10k
R4
R5
4.7k
U1
SCK
SDA
WP
24C16B
C1
10uF

DESKTOP SOFTWARE