BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

EEE 416 (January 2022) **B1**
Microprocessor and Embedded Systems Laboratory

Final Project Report

Bangla Calendar Clock

Evaluation Form:

STEP	DESCRIPTION	MAX	SCORE
1	Report (Format, Reference)	10	
2	Design Method and Complete Design (Hardware Implementation)	15	
3	Video Demonstration	10	
4	Novelty of Design	15	
5	Project Management and Cost Analysis	10	
6	Considerations to Public Health and Safety, Environment and Cultural and Societal Needs	10	
7	Assessment of Societal, Health, Safety, Legal and Cultural issues relevant to the solution	10	
8	Evaluation of the sustainability and impact of designed solutions in societal and environmental contexts	10	
9	Individual Contribution (Viva)	20	
10	Teamwork and Diversity	10	
	TOTAL	120	

Signature of Evaluator: _____

Academic Honesty Statement:

IMPORTANT! Please carefully read and sign the Academic Honesty Statement, below. Type the student ID and Write your name in your own handwriting. *You will not receive credit for this project experiment unless this statement is signed in the presence of your lab instructor.*

"In signing this statement, We hereby certify that the work on this project is our own and that we have not copied the work of any other students (past or present), and cited all relevant sources while completing this project. We understand that if we fail to honor this agreement, We will each receive a score of ZERO for this project and be subject to failure of this course."

Full Name: Md. Sabbir Hossen Bijoy **Student ID: 1706074**	**Full Name: Ahadur Rahman** **Student ID: 1706075**
Full Name: Khandaker Khairuzzaman **Student ID: 1706076**	**Full Name: Kazi Ishrak Ahmed** **Student ID: 1706077**

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1 Abstract

1) To familiarize with the Arm Microprocessor and real life implementation of this family processor.
2) Embedded system design with real life problem solution and generating new ideas.
3) To increase the capability of problem solving ability and using this ability design prototype for practical purposes
4) To get idea about industry scale production and how to implement new ideas into start up something new
5) How to overcome problem to implement a design rather than simulation. These solutions help to grasp the main context of a part of the circuit

2 Introduction

A clock is a mechanical or electronic device that measures time and displays the hours, minutes, seconds, and occasionally the date using hands on a circular dial or displayed figure.
There are several types of clocks available. They are categorized into two basic varieties based on how they display time: (a) analog clocks and (b) digital clocks. A digital clock is a typical gadget for displaying the time. In digital clocks, 7-segment, Alphanumeric, Liquid Crystal, and Graphic displays are often utilized. They display time in English. Digital clocks use numbers to display the time. Analog clocks display the hours, minutes, and seconds with hands. However, we were inspired to create this helpful device that displays time in Bengali to honor our national heroes who gave their lives for our language on February 21, 1952. The digital clocks available in Bangladesh are based on English digits. There is still no Bangla character-based digital clock on the market. In our country, still, there is a significant portion of people deprived of English knowledge. However, a Bangla Calendar clock can make their lives easy. Again in a typical clock, there is just shown the time, whereas a digital clock can simultaneously show the date and days of the week as well and our implemented module can show them in Bangla for easy readability.

3 Design

3.1 Design Method

To design the circuit, we first simulate it using online simulation tool(WOKWI) and then we implement it using an Arduino, an LCD I2C display, and an RTC. First, we must use hex codes to decode the Bangla script. We then integrated these hex codes into an Arduino uno library function to show the Bangla calendar. The day and date showing display, as well as the clock, must be integrated into two separate LCD displays. reduce the lag effect that will impact the circuit clock as much as possible. The date and the days of the week were displayed on LCD Monitor 01, and the real-time clock was displayed on LCD Monitor 02, respectively.

The RTC module was used to extract the device's real time clock. The simulation was used to do the coding. After constructing the circuit, the code was uploaded to the Arduino to obtain the desired output. Then we designed the circuit for cellphone control. A Bluetooth module is used to implement this circuit.

Following that, we had to change the code, and once we had, we were able to use a cell phone to control the circuit. Following information from the cell phone, the date and time were updated. Our circuit is controlled by an external voltage source. As a result, there are two ways we can control the circuit: Bluetooth communication and direct input from the computer.

3.2 Circuit Diagram

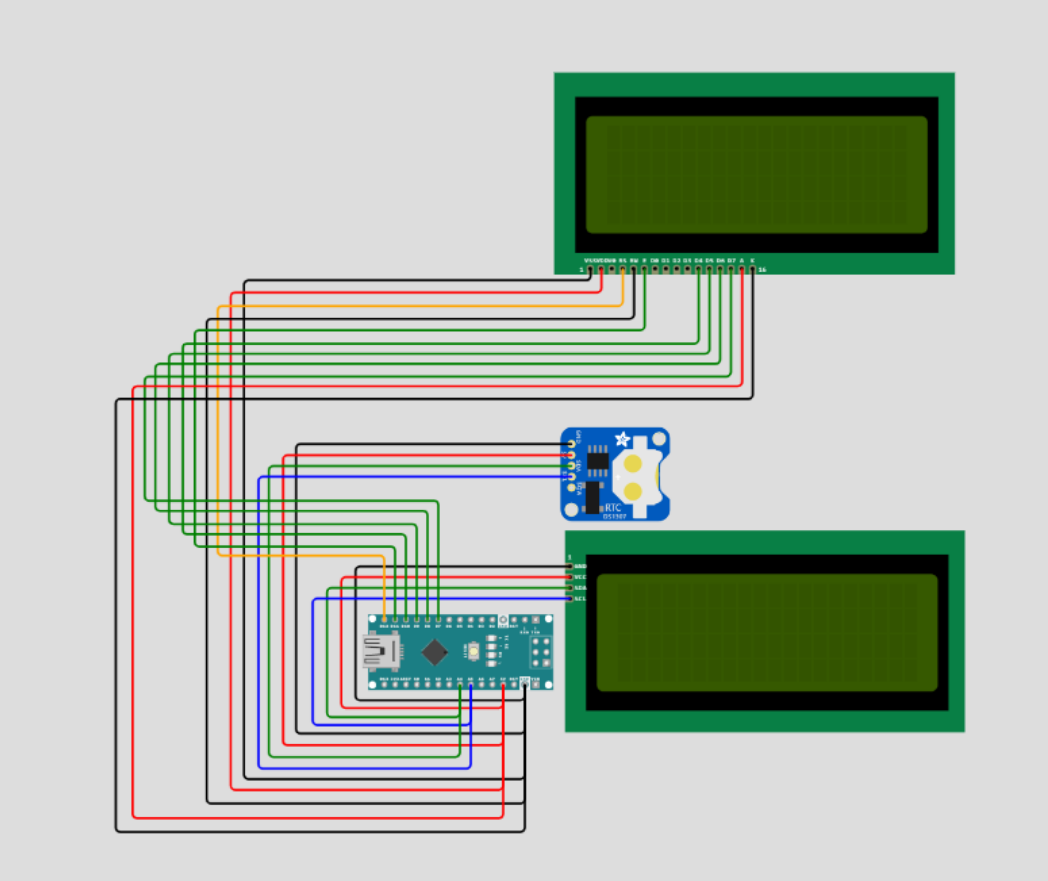


Fig: circuit diagram of our project

3.3 Full Source Code of Firmware

```
#include <Wire.h>
#include "RTClib.h"
#include <LiquidCrystal_I2C.h>
//#include <LiquidCrystal.h>
#include <SoftwareSerial.h>
#include<string.h>
#include <stdio.h>
#include <ctype.h>
#include <stdlib.h>

//LiquidCrystal lcd3(12, 11, 10, 9, 8, 7);
int clockOn=0;
int year;
int month;
int day;
SoftwareSerial Bluetooth(5,6);
const unsigned long eventTime_1 = 500; // interval in
ms
const unsigned long eventTime_2 = 10000;
int ce=0;
unsigned long previousTime_1 = 0;
unsigned long previousTime_2 = 0;

int rotate=1;

char BT_input;
int n = 0;
char text;
char date[26];
```

```
else if(second1==7)
 {
   lcd3.createChar(4, seven);
 }
 else if(second1==8)
 {
   lcd3.createChar(4, eight);
 }
 else if(second1==9)
 {
   lcd3.createChar(4, nine);
 }
 if(second2==0)
 {
   lcd3.createChar(5, zero);
 }
 else if(second2==1)
 {
   lcd3.createChar(5, one);
 }
 else if(second2==2)
 {
   lcd3.createChar(5, two);
 }
 else if(second2==3)
 {
   lcd3.createChar(5, three);
 }
 else if(second2==4)
```

```
char times[26];
int i=0,j=0,k=0;
int stat=0;
char t[2];


char* token,token1;
char chour[][15]={"","",""};
char cdate[][15]={"","",""};
int hc=0,dc=0;
int si,wi=0;
int c=0;

RTC_DS1307 RTC;
char a[20];
LiquidCrystal_I2C lcd(0x27,20,4);
LiquidCrystal_I2C lcd3(0x26,20,4);


char daysOfTheWeek[7][12] = {"Sunday", "Monday",
"Tuesday", "Wednesday", "Thursday", "Friday",
"Saturday"};
byte r[] = {
  0x0,0x1f,0x6,0xa,0x1a,0xa,0x6,0x12,
};
byte bi[] = {
  0xf,0x10,0x1f,0x13,0x15,0x15,0x13,0x11,
};
byte ba[] = {
  0x0,0x1f,0x5,0xd,0x15,0xd,0x5,0x0,
};
byte shu[] = {
  0x0,0x17,0x9,0x15,0x1,0x6,0x11,0xf,
};
byte cro[] = {
  0x0,0x1f,0xc,0x6,0x15,0x1c,0x4,0x0,
};
byte ono[] = {
  0x0,0x0,0xc,0xc,0x0,0x2,0x3,0x1,
};
byte se[] = {
  0x0,0x1f,0x15,0x15,0x17,0x1d,0x11,0x9,
};
byte am[] = {
  0x0,0x1f,0x19,0x15,0x1f,0x1d,0x11,0x0,
};
byte bu[] = {
  0x0,0x1f,0x6,0xa,0xe,0x2,0x6,0x1,
};
byte bri[] = {
  0x0,0x1f,0x6,0xa,0x6,0x2,0xc,0x2,
};
byte sp[] = {
  0x14,0xc,0x15,0x1d,0xb,0x5,0x9,0x1,
};
byte m[] = {
  0x0,0x1f,0x9,0x5,0x5,0xf,0xd,0x1,
};
byte l[] = {
  0x0,0x1f,0x1,0x1,0x1b,0x15,0x1,0x1,
};
byte dh[] = {
  0x4,0x8,0x7,0xa,0xa,0x6,0x2,0x0,
};
byte g[] = {
  0x0,0xd,0x13,0x19,0x5,0x1d,0x1,0x1,
};
byte h[] = {
  0x0,0x1f,0xc,0xa,0x2,0xc,0x6,0x1,
};
byte ti[] = {
  0xf,0x10,0x1f,0x16,0x15,0x11,0x19,0x16,
};
byte sho[] = {
  0x1,0x17,0x9,0x15,0x1,0x1,0x1,0x0,
};
byte ni[] = {
  0x7,0x8,0xf,0x9,0xf,0xd,0x9,0x0,
};
byte zero[]={0x0,0xe,0x11,0x11,0x11,0x11,0xe,0x0,};
byte one[]={0x8,0x8,0x4,0x2,0x1,0x1,0xe,0x4,};
byte two[]={0x8,0x8,0x4,0x2,0x2,0xc,0x2,0x1,};
byte three[]={0x0,0x17,0x15,0x11,0x11,0x11,0xe,0x0,};
byte four[]={0xe,0x11,0xa,0x4,0xa,0x11,0xe,0x0,};
byte five[]={0x0,0x14,0x1c,0x14,0x15,0x17,0x11,0x1e,};
 {
   lcd3.createChar(5, four);
 }
 else if(second2==5)
 {
   lcd3.createChar(5, five);
 }
 else if(second2==6)
 {
   lcd3.createChar(5, six);
 }
 else if(second2==7)
 {
   lcd3.createChar(5, seven);
 }
 else if(second2==8)
 {
   lcd3.createChar(5, eight);
 }
 else if(second2==9)
 {
   lcd3.createChar(5, nine);
 }
 lcd3.begin(16,2);
  lcd3.setCursor(4,0);
  lcd3.write(byte(0));
  lcd3.write(byte(1));
  lcd3.write(':');
  lcd3.write(byte(2));
  lcd3.write(byte(3));
  lcd3.write(':');
  lcd3.write(byte(4));
  lcd3.write(byte(5));

}
void Date(int year, int month , int date)
{
 int year2=year%10;
 year=year/10;
 int year1=year%10;
 year=year/10;

 int month2=month%10;
 month=month/10;
 int month1=month%10;
 month=month/10;

 int date2=date%10;
 date=date/10;
 int date1=date%10;
 date=date/10;
//  lcd2.clear();
 if(date1==0)
 {
   lcd.createChar(0, zero);
 }
 else if(date1==1)
 {
   lcd.createChar(0, one);
 }
 else if(date1==2)
 {
   lcd.createChar(0, two);
 }
 else if(date1==3)
 {
   lcd.createChar(0, three);
 }
 else if(date1==4)
 {
   lcd.createChar(0, four);
 }


 else if(date1==5)


lcd.createChar(0, five);
 }
 else if(date1==6)
 {
   lcd.createChar(0, six);
 }
 else if(date1==7)
 {
   lcd.createChar(0, seven);
```

```
byte six[]={0x0,0x4,0x4,0x15,0x17,0x11,0x11,0xe,};
byte seven[]={0x4,0xa,0x11,0xf,0x1,0x1,0x1,0x1,};
byte eight
//Week days
void monday()
{

  lcd.createChar(0, se);
  lcd.createChar(1, am);
  lcd.createChar(2, ba);
  lcd.createChar(3, r);
  lcd.begin(16,2);
  lcd.setCursor(5,1);
  lcd.write(byte(0));
  lcd.write(byte(1));
  lcd.write(byte(2));
  lcd.write(byte(3));

}
void tuesday()
{

  lcd.createChar(0, m);
  lcd.createChar(1, ono);
  lcd.createChar(2, g);
  lcd.createChar(3, l);
  lcd.createChar(4, ba);
  lcd.createChar(5, r);

  lcd.begin(16,2);
  lcd.setCursor(5,1);
  lcd.write(byte(0));
  lcd.write(byte(1));
  lcd.write(byte(2));
  lcd.write(byte(3));
  lcd.write(byte(4));
  lcd.write(byte(5));


}

void wednesday()
{

  lcd.createChar(0, bu);
  lcd.createChar(1, dh);
  lcd.createChar(2, ba);
  lcd.createChar(3, r);
  lcd.begin(16,2);
  lcd.setCursor(5,1);
  lcd.write(byte(0));
  lcd.write(byte(1));
  lcd.write(byte(2));
  lcd.write(byte(3));

}

void thursday()
{

  lcd.createChar(0, bri);
  lcd.createChar(1, h);
  lcd.createChar(2, sp);
  lcd.createChar(3, ti);
  lcd.createChar(4, ba);
  lcd.createChar(5, r);
  lcd.begin(16,2);
  lcd.setCursor(5,1);
  lcd.write(byte(0));
  lcd.write(byte(1));
  lcd.write(byte(2));
  lcd.write(byte(3));
  lcd.write(byte(4));
  lcd.write(byte(5));

}

void friday()
{

  lcd.createChar(0, shu);
  lcd.createChar(1, cro);
  lcd.createChar(2, ba);
  lcd.createChar(3, r);
  lcd.begin(16,2);
 }
 else if(date1==8)
 {
   lcd.createChar(0, eight);
 }
 else if(date1==9)
 {
   lcd.createChar(0, nine);
 }

 if(date2==0)
 {
   lcd.createChar(1, zero);
 }
 else if(date2==1)
 {
   lcd.createChar(1, one);
 }
 else if(date2==2)
 {
   lcd.createChar(1, two);
 }
 else if(date2==3)
 {
   lcd.createChar(1, three);
 }
 else if(date2==4)
 {
   lcd.createChar(1, four);
 }
 else if(date2==5)
 {
   lcd.createChar(1, five);
 }
 else if(date2==6)
 {
   lcd.createChar(1, six);
 }
 else if(date2==7)
 {
   lcd.createChar(1, seven);
 }
 else if(date2==8)
 {
   lcd.createChar(1, eight);
 }
 else if(date2==9)
 {
   lcd.createChar(1, nine);
 }

if(month1==0)
 {
   lcd.createChar(2, zero);
 }
 else if(month1==1)
 {
   lcd.createChar(2, one);
 }
 else if(month1==2)
 {
   lcd.createChar(2, two);
 }
 else if(month1==3)
 {
   lcd.createChar(2, three);
 }
 else if(month1==4)
 {
   lcd.createChar(2, four);
 }
 else if(month1==5)
 {
   lcd.createChar(2, five);
 }
 else if(month1==6)
 {
   lcd.createChar(2, six);
 }
 else if(month1==7)
 {
   lcd.createChar(2, seven);
 }
 else if(month1==8)
 {
```

```
  lcd.setCursor(5,1);
  lcd.write(byte(0));
  lcd.write(byte(1));
  lcd.write(byte(2));
  lcd.write(byte(3));

}
void saturday()
{

  lcd.createChar(0, sho);
  lcd.createChar(1, ni);
  lcd.createChar(2, ba);
  lcd.createChar(3, r);
  lcd.begin(16,2);
  lcd.setCursor(5,1);
  lcd.write(byte(0));
  lcd.write(byte(1));
  lcd.write(byte(2));
  lcd.write(byte(3));

}

void sunday()
{

  lcd.createChar(0, r);
  lcd.createChar(1, bi);
  lcd.createChar(2, ba);
  lcd.begin(16,2);
  lcd.setCursor(5,1);
  lcd.write(byte(0));
  lcd.write(byte(1));
  lcd.write(byte(2));
  lcd.write(byte(0));

}

void dOfTheWeek(char *a)
{
  lcd.clear();
  if(!strcmp("Monday",a))
      monday();
  if(!strcmp("Tuesday",a))
      tuesday();
  if(!strcmp("Wednesday",a))
      wednesday();
  if(!strcmp("Thursday",a))
      thursday();
  if(!strcmp("Friday",a))
      friday();
  if(!strcmp("Saturday",a))
      saturday();
  if(!strcmp("Sunday",a))
      sunday();
void Time(int hour, int mins , int second)
{
  if(hour>12)
    hour-=12;
  int second2=second%10;
 second=second/10;
 int second1=second%10;
 second=second/10;

 int mins2=mins%10;
 mins=mins/10;
 int mins1=mins%10;
 mins=mins/10;

 int hour2=hour%10;
 hour=hour/10;
 int hour1=hour%10;
 hour=hour/10;
  //lcd3.clear();
  lcd3.backlight();
 if(hour1==0)
 {
   lcd3.createChar(0, zero);
 }
 else if(hour1==1)
 {
   lcd3.createChar(0, one);
 }
 else if(hour1==2)
 {
   lcd.createChar(2, eight);
 }
 else if(month1==9)
 {
   lcd.createChar(2, nine);
 }

if(month2==0)
 {
   lcd.createChar(3, zero);
 }
 else if(month2==1)
 {
   lcd.createChar(3, one);
 }
 else if(month2==2)
 {
   lcd.createChar(3, two);
 }
 else if(month2==3)
 {
   lcd.createChar(3, three);
 }
 else if(month2==4)
 {
   lcd.createChar(3, four);
 }
 else if(month2==5)
 {
   lcd.createChar(3, five);
 }
 else if(month2==6)
 {
   lcd.createChar(3, six);
 }
 else if(month2==7)
 {
   lcd.createChar(3, seven);
 }
 else if(month2==8)
 {
   lcd.createChar(3, eight);
 }
 else if(month2==9)
 {
   lcd.createChar(3, nine);
 }
 if(year1==0)
 {
   lcd.createChar(4, zero);
 }
 else if(year1==1)
 {
   lcd.createChar(4, one);
 }
 else if(year1==2)
 {
   lcd.createChar(4, two);
 }
 else if(year1==3)
 {
   lcd.createChar(4, three);
 }
 else if(year1==4)
 {
   lcd.createChar(4, four);
 }
 else if(year1==5)
 {
   lcd.createChar(4, five);
 }
 else if(year1==6)
 {
   lcd.createChar(4, six);
 }
 else if(year1==7)
 {
   lcd.createChar(4, seven);
 }
 else if(year1==8)
 {
   lcd.createChar(4, eight);
 }
 else if(year1==9)
 {
```

```
   lcd3.createChar(0, two);
 }
 else if(hour1==3)
 {
   lcd3.createChar(0, three);
 }
 else if(hour1==4)
 {
   lcd3.createChar(0, four);
 }
 else if(hour1==5)
 {
   lcd3.createChar(0, five);
 }
 else if(hour1==6)
 {
   lcd3.createChar(0, six);
 }
 else if(hour1==7)
 {
   lcd3.createChar(0, seven);
 }
 else if(hour1==8)
 {
   lcd3.createChar(0, eight);
 }
 else if(hour1==9)
 {
   lcd3.createChar(0, nine);
 }

 if(hour2==0)
 {
   lcd3.createChar(1, zero);
 }
 else if(hour2==1)
 {
   lcd3.createChar(1, one);
 }
 else if(hour2==2)
 {
   lcd3.createChar(1, two);
 }
 else if(hour2==3)
 {
   lcd3.createChar(1, three);
 }
 else if(hour2==4)
 {
   lcd3.createChar(1, four);
 }
 else if(hour2==5)
 {
   lcd3.createChar(1, five);
 }
 else if(hour2==6)
 {
   lcd3.createChar(1, six);
 }
 else if(hour2==7)
 {
   lcd3.createChar(1, seven);
 }
 else if(hour2==8)
 {
   lcd3.createChar(1, eight);
 }
 else if(hour2==9)
 {
   lcd3.createChar(1, nine);
 }

if(mins1==0)
 {
   lcd3.createChar(2, zero);
else if(mins1==1)
 {
   lcd3.createChar(2, one);
 }
 else if(mins1==2)
 {
   lcd3.createChar(2, two);
 }
 else if(mins1==3)
 {
   lcd.createChar(4, nine);
 }
 if(year2==0)
 {
   lcd.createChar(5, zero);
 }
 else if(year2==1)
 {
   lcd.createChar(5, one);
 }
 else if(year2==2)
 {
   lcd.createChar(5, two);
 }
 else if(year2==3)
 {
   lcd.createChar(5, three);
 }
 else if(year2==4)
 {
   lcd.createChar(5, four);
 }
 else if(year2==5)
 {
   lcd.createChar(5, five);
 }
 else if(year2==6)
 {
   lcd.createChar(5, six);
 }
 else if(year2==7)
 {
   lcd.createChar(5, seven);
 }
 else if(year2==8)
 {   lcd.createChar(5, eight);
 }
 else if(year2==9)
 {
   lcd.createChar(5, nine);
 }
 lcd.begin(16,2);
  lcd.setCursor(4,0);
  lcd.write(byte(0));
  lcd.write(byte(1));
  lcd.write('/');
  lcd.write(byte(2));
  lcd.write(byte(3));
  lcd.write('/');
  lcd.write(byte(4));
  lcd.write(byte(5));
}

//////////////////////////////////////////////////
//////////////////////////////////////////
void setup () {
  Serial.begin(9600);
  lcd.init();
  //lcd2.init();
  lcd.begin(20, 4);
  lcd.backlight();

  lcd3.begin(20, 4);
  //lcd3.backlight();

  Wire.begin();
  RTC.begin();
 Bluetooth.begin(9600);
  if ( RTC.isrunning()) {
    Serial.println("RTC is NOT running!");
    if(!clockOn){
    //RTC.adjust(DateTime(F(__DATE__), F(__TIME__)));
    clockOn++;}
  }
}

void loop () {


    DateTime now = RTC.now();

    lcd.setCursor(1,0);
    //dOfTheWeek(daysOfTheWeek[now.dayOfTheWeek()]);
```

```
   lcd3.createChar(2, three);
 }
 else if(mins1==4)
 {
   lcd3.createChar(2, four);
 }
 else if(mins1==5)
 {
   lcd3.createChar(2, five);
 }
 else if(mins1==6)
 {
   lcd3.createChar(2, six);
 }
 else if(mins1==7)
 {
   lcd3.createChar(2, seven);
 }
 else if(mins1==8)
 {
   lcd3.createChar(2, eight);
 }
 else if(mins1==9)
 {
   lcd3.createChar(2, nine);
 }

if(mins2==0)
 {
   lcd3.createChar(3, zero);
 }
 else if(mins2==1)
 {
   lcd3.createChar(3, one);
 }
 else if(mins2==2)
 {
   lcd3.createChar(3, two);
 }
 else if(mins2==3)
 {
   lcd3.createChar(3, three);
 }
 else if(mins2==4)
 {
   lcd3.createChar(3, four);
 }
 else if(mins2==5)
 {
   lcd3.createChar(3, five);
 }
 else if(mins2==6)
 {
   lcd3.createChar(3, six);
 }
 else if(mins2==7)
 {
   lcd3.createChar(3, seven);
 }
 else if(mins2==8)
 {
   lcd3.createChar(3, eight);
 }
 else if(mins2==9)
 {
   lcd3.createChar(3, nine);
 }
 if(second1==0)
 {
   lcd3.createChar(4, zero);
 }
 else if(second1==1)
 {
   lcd3.createChar(4, one);
 }
 else if(second1==2)
 {
   lcd3.createChar(4, two);
 }
 else if(second1==3)
 {
   lcd3.createChar(4, three);
 }
 else if(second1==4)
 {
```

```
    unsigned long currentTime = millis();

/* This is event 1 stuff*/
if( currentTime - previousTime_1 >= eventTime_1 ){

  if (Bluetooth.available())
  {

    BT_input=(Bluetooth.read());
    Serial.println(Bluetooth.available());
    if(!ce){
      strcpy(cdate[0],"");
  strcpy(chour[0],"");
  strcpy(cdate[1],"");
  strcpy(chour[1],"");
  strcpy(cdate[2],"");
  strcpy(chour[2],"");
  strcpy(date,"");
  strcpy(times,"");
i=0;
j=0;
stat=0;
ce++;
clockOn=0;
}
    if(BT_input=='-')
    {
      date[i++]='\0';
      stat=stat%3+1;
    }
    if(stat==0)
    {
      date[i++]=BT_input;
      }
      if(BT_input=='#')
    {
      times[j++]='\0';
      stat=stat%3+1;
    }
    if(stat==1&&BT_input!='-')
    {
      times[j++]=BT_input;
      }



  }
{


else
if(!strcmp(cdate[0],"")||!strcmp(cdate[1],"")||!strcmp
(cdate[2],"")||!strcmp(chour[0],"")||!strcmp(chour[1],
"")||!strcmp(chour[2],"")){
 Serial.println(times);
 Serial.println(date);
cdate[0][0]=date[0];
cdate[0][1]=date[1];
cdate[0][2]='\0';
cdate[1][0]=date[3];
cdate[1][1]=date[4];
cdate[1][2]='\0';
cdate[2][0]=date[6];
cdate[2][1]=date[7];
cdate[2][2]='\0';
chour[0][0]=times[0];
chour[0][1]=times[1];
chour[0][2]='\0';
chour[1][0]=times[3];
chour[1][1]=times[4];
chour[1][2]='\0';
chour[2][0]=times[6];
chour[2][1]=times[7];
chour[2][2]='\0';
 Serial.println(cdate[0]);
 Serial.println(cdate[1]);
 Serial.println(cdate[2]);
   Serial.println(chour[0]);
 Serial.println(chour[1]);
 Serial.println(chour[2]);
if(!clockOn)
RTC.adjust(DateTime(2000+atoi(cdate[2]),atoi(cdate[1])
,atoi(cdate[0]), atoi(chour[0]), atoi(chour[1]),
atoi(chour[2])));ce=0;clockOn++;
```

```
  lcd3.createChar(4, four);
}
else if(second1==5)
{
  lcd3.createChar(4, five);
}
else if(second1==6)
{
  lcd3.createChar(4, six);
```

```
}

  // Update the timing for the next event
  previousTime_1 = currentTime;

Time(int(now.hour()),int(now.minute()),int(now.second(
)));
 // Serial.println(now.second());
 if(rotate==1){
    lcd.clear();

Date(int(now.year()),int(now.month()),int(now.day()));

 }



  if(rotate==2){
  lcd.clear();
  dOfTheWeek(daysOfTheWeek[now.dayOfTheWeek()]);



  }
  rotate=rotate%2+1;

}
```

Table: Source Code for the main program

4 Implementation

4.1 Description

We have designed real time clock and calendar in Bangla alphabet. This was done by embedded system. Then we also implement this circuit to be controlled by cell phone. So we have used communication module to done this work.

Components Used:

- LCD I2C Display (1602)
- Arduino uno
- RTC DS1307
- Bluetooth module HC-05
- Power source- of 9 V
- Jumper wire

Description of the components:

1) **LCD I2C Display:**
   For displaying text, numbers, and special characters, the character LCD is perfect. A small add-on circuit (backpack) is built into LCDs and is mounted to the LCD module's back. The module has an adjustable potentiometer for adjusting the intensity of the LED backlight as well as

a controller chip that handles I2C communications. I2C LCDs have the benefit of simple wiring and only requiring two data pins to control the LCD. Over ten connections are needed for a typical LCD, which can be a problem if Arduino only has a limited number of GPIO pins. If LCD happens to not have an I2C interface built into the design. Each character is displayed on the LCD screen using a 5 by 8 pixel matrix grid. These pixels can easily be programmed to display customized characters in addition to regular text, numbers, and special characters.

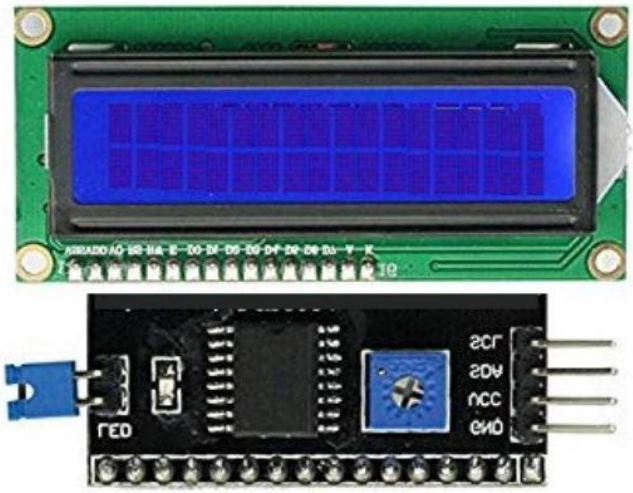


Fig: LCD I2C Display

The I2C 16×2 Arduino LCD Screen is using an I2C communication interface. It is able to display 16×2 characters on 2 lines, white characters on blue background. The I2C is a type of serial bus developed by Philips, which uses two bidirectional lines, called SDA (Serial Data Line) and SCL (Serial Clock Line). Both must be connected via pulled-up resistors. The usage voltages are standard as 5V and 3.3V.

2) Arduino Uno:

A microcontroller board called Arduino Uno is based on the ATmega328P. (datasheet). It has a 16 MHz quartz crystal, 6 analog inputs, 14 digital input/output pins (of which 6 can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. It comes with everything required to support the microcontroller; to use it, just plug in a USB cable, an AC-to-DC adapter, or a battery to power it. The Arduino Uno board can be powered via a USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector. The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage

regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

Fig: Arduino uno

3) **RTC (DS1307):**

The DS1307 serial real-time clock (RTC) is a low Ypower, full binary-coded decimal (BCD) clock/calendar plus 56 bytes of NV SRAM. Address and data are transferred serially through an I2 C, bidirectional bus. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12- hour format with AM/PM indicator. The DS1307 has a built-in power-sense circuit that detects power failures and automatically switches to the backup supply. Timekeeping operation continues while the part operates from the backup supply. In many embedded system, we need to put time stamp while logging data i.e. sensor values, GPS coordinates etc. For getting timestamp, we need to use RTC (Real Time Clock).

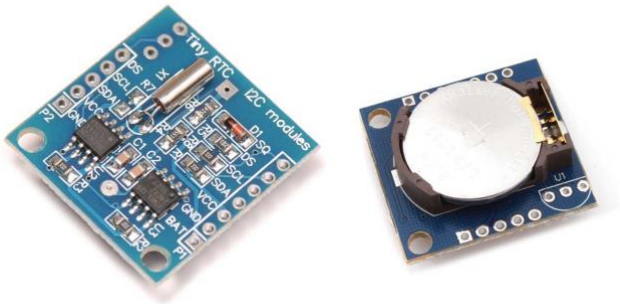


Fig: RTC DS1307 module

Generally, while using RTC (Real Time Clock) first time, we need to set current time and date in RTC. Then RTC keeps updating these values in seconds. In RTC DS1307, we can set this time and date in the **Timekeeper Register**. After setting time and date value, RTC DS1307 keeps updating it in seconds so we will get updated time later.

4) **Bluetooth module HC-05:**

HC-05 Bluetooth module is a Bluetooth to serial converter that connects microcontrollers (like Arduino) to other Bluetooth enabled devices. HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

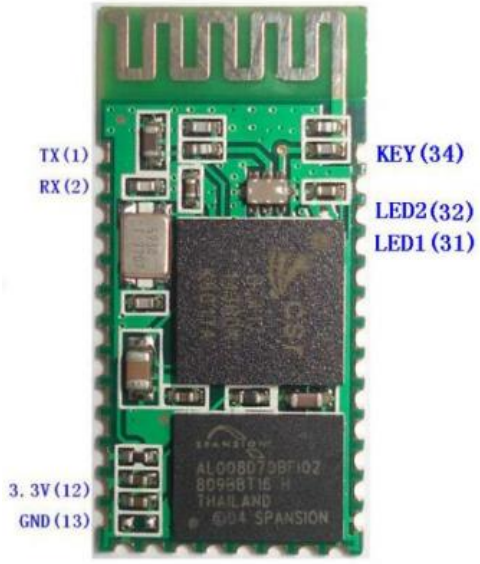


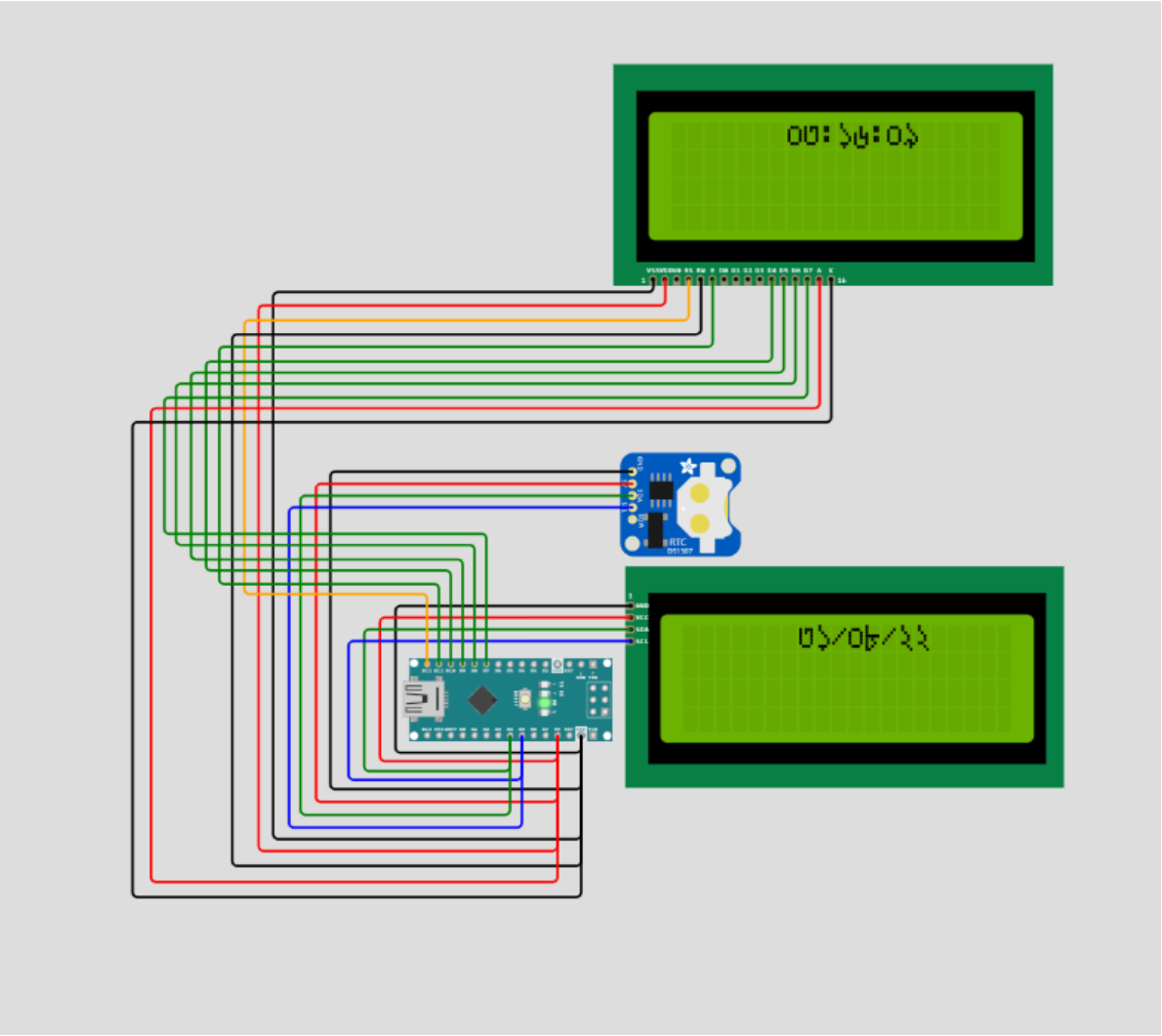
Fig: Bluetooth module HC-05

The HC-05 is a popular module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The module communicates with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USAR.

4.2 Results

As soon as the Code is uploaded, the Arduino will boot up. And then it will try the connection to the display Connected. This log can be viewed on Serial Monitor as well as in LCD Display. The RTC will then calculate the time and date. It will show up into the LCD display. For the cell phone control we have to connect our phone through the Bluetooth module to the Arduino. When command will transfer to the module clock will be updated very quickly.

Simulation output:



4.3 Github Link

4.4 YouTube Link

5 Design Analysis and Evaluation

5.1 Novelty

We were able to design the model with the fewest conceivable components, making it far less expensive than previous works. Our circuit diagram is also simpler. Then again as the assembly can be done easily in our local workstations, the import cost can be reduced. In recent times, most of the digital calendars are imported from China directly, so our goods can be a better replacement here as Digital Bangla Calendar Clock is almost seen nowhere. Our module costs around 2800 BDT while a commercial digital calendar normally costs around 3500 BDT. So, here we've got an upper hand.

In our EEE department only in the classrooms apart from labs, we need at least 12 clocks for 3 sections of each level, which cost around 42000 BDT for a conventional digital calendar clock, whereas our module price for this will be around 34000 BDT.

5.2Project Management and Cost Analysis

5.2.1 Bill of Materials

Component	Unit price (Taka)	Quantity	Cost (Taka)
Arduino Uno	1200	2	2400
LCD I2C display	350	4	1400
RTC DS1307	30	4	120
Bluetooth HC-05	390	2	780
Lipo 9v Battery	450	2	900
Jumper wire set	60	2	120
		Total =	5780

5.2.2 Calculation of Per Unit Cost of Prototype:

Component	Unit price (Taka)	Quantity	Cost (Taka)
Arduino Uno	1200	1	1200

LCD I2C display	350	2	700
RTC DS1307	30	1	30
Bluetooth HC-05	390	1	390
Lipo 9v Battery	450	1	450
Jumper wire set	60	2	120
		Total =	2890

5.2.3 Calculation of Per Unit Cost of Mass-Produced Unit:

In case of mass production we analyze the price of each product. For large scale production unit product price can be minimized.

Component	Unit price (Taka)	Quantity	Cost (Taka)
Arduino Uno	1150	1	1150
LCD I2C display	330	2	660
RTC DS1307	28	1	28
Bluetooth HC-05	350	1	350
Lipo 9v Battery	440	1	440
Jumper wire set	55	2	110
		Total =	2738

We can save total of 152/= taka in per unit production if we go for mass production.

5.2.4 Timeline of Project Implementation

Here is the timeline of our project implementation:

8th week	Planning and algorithm development
9th week	Coding and Simulation
10th week	Hardware design
11th week	Feature upgradation
12th week	Circuit testing and debugging
13th week	Report and others work

5.3 Practical Considerations of the Design to Address Public Health and Safety, Environment, Cultural, and Societal Needs

5.3.1 Considerations to public health and safety

We were concerned about public health and safety while working on our project. We did not employ any hazardous materials in our project that can make public safety vulnerable. Because we intend to expand into mass manufacturing, public health and safety are key concerns. We made every effort to assure that no one would be harmed if they used our module. Our product will be simple and convenient to use. If a customer has a health or safety concern, they can contact us, and we will do our utmost to assist them.

5.3.2 Considerations to environment

We will monitor the use of plastic while working on our project and will prevent open disposal to the environment. The battery will be used to recycle. The usage of paper may be lessened after utilizing our product as decaying paper does significant harm to soil fertility, reducing our food production. Furthermore, our project produces no hazardous and toxic gas. As a result, we may infer that our project is quite environmentally friendly. Again our used frame is reusable and also biodegradable.

5.3.3 Considerations to cultural and societal needs

While working on our project, we tried to balance cost and quality. The product we are now using is not that much cost-efficient. If we perform mass production, with continuous upgrading, the price of our product will be significantly lower than the price of the existing product we are utilizing.

5.4 Assessment of the Impact of the Project on Societal, Health, Safety, Legal and Cultural Issues

5.4.1 Assessment of Societal Issues

Nowadays, the paper-made conventional calendar is not that much used, rather in every institution and even at home, we can see digital display clock which is easy to use for its upgraded features. People look for the date and days simultaneously in a calendar which is unavailable in paper-made calendars.

5.4.2 Assessment of Health and Safety Issues

Digital Bangla calendar clock can be used in workstations for maintaining working hours for general laborers in every unit and their safety limit of work can be maintained which is important for their health. Sometimes excessive working time in high-load factories can cause severe and permanent health damage so the workers can also be aware of this by seeing this calendar clock.

5.4.3 Assessment of Legal Issues

We have mentioned the references from where we gathered ideas and then we entirely made this module on our own. So using it without copyright is unethical and criminal activity.

5.4.4 Assessment of Cultural Issues

Again as Bangla is our mother language, it will be very popular in all sectors to use. In our classrooms, the clocks are not synchronized with our real-time as we have to manually set the time in them. But in our module, we just need to pass the current time as input from our mobile app which is very handy and it will automatically synchronize with the real-time which is helpful for all involved in all other classrooms to monitor time synchronously and continue the activities conveniently. Again we can use it as a go-to-date function as it can show exactly that date and day of even past and future besides the current ones with the date passed in it.

5.5 Evaluation of the Sustainability the and Impact of the Designed Solution in the Societal and Environmental Contexts

5.5.1 Evaluation of Sustainability

Sustainability consideration is a great factor for any product before use. Out of 1000 people in Australia, overall, 70% rely on a digital calendar most to manage their life, with 46.7% of respondents (470) relying most on their mobile calendar, and 23.3% of respondents (234) relying on a desktop calendar. Paper calendars such as a diary, journal, or planner are preferred by 28.3% of respondents (278). It's showing the reliance of people on digital calendars. We have protected the hardware elements with a strong frame body so easy damage is prevented and it can give service for a long time. Again as we are careful of the disposal of crucial environment-affecting elements as the vendor, environment-safe use can be ensured. So it can become sustainable in the long run.

5.5.2 Evaluation of Impact of Design in Societal Context

We may not see the Bangla calendar clock everywhere as maximum electronic calendars come from China. Bangladesh's Imports from China of Electrical and electronic equipment were US$944.65 Million in 2015, according to the United Nations COMTRADE database on international trade which is increasing year by year for the uprising demand. We have no significant vendor for selling Bangla calendar clocks, so at last, we need to depend on paper-made calendars. But our product can be very popular in all working sectors, especially in rural areas and as it's cheaper so its surely going to be popular among people. It's also handy for its lightweight. As it's made of a microcontroller and available circuit elements, it's cheaper. So it easily can

motivate the customers to buy and use it.

5.5.3 Evaluation of Impact of Design in Environmental Context

Electronic wastes are one of the fastest-growing waste streams globally. It is e-scraps or wastes from electric and electronic equipment (WEEE); complex chemical, hazardous, and mostly disposed in the general wastes, especially in developing countries. As of now, up to 97 percent of the waste is recycled in the informal sector that employs low-paid workers. And the processing steps include cleaning, melting and incineration. These workers are unaware of any safety measures. Through these activities acids are used to extract precious metals that also release toxic metals such as lead, cadmium, mercury, chromium, and other toxins into the air, causing environmental pollution. Again, In the last 15 years, Bangladesh's annual per capita plastic consumption in urban areas tripled to 9.0 kg in 2020 from 3.0 kg in 2005. Consumption of LDPE packaging materials (plastic bags, etc.) increased fivefold in 2020 from 2005. Of the 977,000 tons of plastic consumed in 2020, only 31 percent were recycled. Most mismanaged plastic waste was single-use plastics like shopping bags, packs, and wrappers. Mismanaged plastic waste is polluting cities, the countryside, rivers, and canals. They clog drains, causing urban flooding. Plastic is a material that degrades slowly and into tiny particles (called microplastics), posing a significant risk to humans, marine life, and ecosystems. Our design doesn't do any harm to the environment or workers directly as the leakage of any harmful or toxic elements is prevented here. We are fully aware of plastic disposal and as we guarantee its longevity so plastic damage and disposal won't need to happen often.

6 Reflection on Individual and Team work

6.1 Individual Contribution of Each Member

Every group member our team worked together and helped each other. But we divided our work into segments and worked accordingly. But we merge our work together. Here's the contribution of our teammates:

Name	Student id	Contribution
Md. Sabbir Hossen Bijoy	1706074	
Ahadur Rahman	1706075	
Khandaker Khairuzzaman	1706076	
Kazi Ishrak Ahmed	1706077	

6.2 Mode of TeamWork

Team work is one of the most important things in doing collective work like project. In our case we distribute our work at first and we have done at least one meeting in each week after allocation of the project. We help each other from very beginning of the project. We discussed our problems and shared our knowledge with each other. We try to follow the working principle of team work. We motivate each other even help to solve the problems of others. This helps us in a various way as we can focus on others academics works too and discussion makes our work far better. Discussion and continuous meeting helps us to debug our problems very quickly. For that reason, we get our desired results very smoothly. So, we depended on each other and that improved our work quality.

6.3 Diversity Statement of Team

One of the members of our group is from electronics major, one is from communication major, and the remaining two are from power majors. Additionally, two of our team members does not live in BUET hall, making it challenging to coordinate our work. But because of the excitement and dedication of every team member, working on our project is easy. We conquer these kinds of obstacles and worked together to achieve our goals.

6.4 Log Book of Project Implementation

Date	Milestone achieved	Individual Role	Team Role	Comments
16.07.22	Meeting held to discuss workflow	Ahad, Bijoy, Khairuzzaman & Ishrak	All members attended the meeting	
19.07.22	Listing the required components to buy	Ahad, Bijoy, Khairuzzaman & Ishrak	All members attended	
22.07.22	Buying the components	Ahad & Ishrak	2 of the Dhaka residents involved	
25.07.22	Coding begins	Ahad, Khairuzzaman & Ishrak	3 members involved	
28.07.22	Coding & software simulation running	Ahad, Bijoy, Khairuzzaman & Ishrak	All the 4 members involved	
04.08.22	Software simulation done and circuit design began	Bijoy, Ahad & Ishrak	3 members involved	

08.08.22	Hardware components assembly initialization	Bijoy, Khairuzzaman & Ishrak	3 members involved	
08.08.22	Hardware progress	Ahad, Bijoy & Khairuzzaman	3 members involved	
11.08.22	Completion of module without IOT	Ahad, Bijoy, Khairuzzaman & Ishrak	All the members involved	
16.08.22	IOT including began	Ahad, Ishrak & Bijoy	3 members involved	
21.08.22	IOT inclusion done	Ahad, Ishrak, Bijoy & Khairuzzaman	All the members involved	
25.08.22	Hardware components remodification began	Ahad, Bijoy & Khairuzzaman	3 members involved	
27.08.22	Completion of hardware part	Ahad, Ishrak, Bijoy & Khairuzzaman	All the members involved	
28.08.22	Video demonstration making	Ahad, Ishrak, Bijoy & Khairuzzaman	All the members involved	
30.08.22	Report writing	Ahad, Ishrak, Bijoy & Khairuzzaman	All the members involved	
31.08.22	Submission	Ahad, Bijoy, Khairuzzaman & Ishrak	All the members involved	A collective team effort of all made it successful

7 References

1) *LCD I2C datasheet-https://www.infineon.com/dgdl/Infineon-Component_I2C_LCD_V1.10-Software%20Module%20Datasheets-v01_02-EN.pdf?fileId=8ac78c8c7d0d8da4017d0e9cfdee232b*
2) *RTC-DS1307 Datasheet-https://datasheets.maximintegrated.com/en/ds/DS1307.pdf*
3) *Bluetooth HC-05 Datasheet-https://www.gme.cz/data/attachments/dsh.774-003.1.pdf*
4) *Arduino Uno datasheet-https://docs.arduino.cc/resources/datasheets/A000066-datasheet.pdf*
5) *Displaying Regional Languages on LCD using Arduino*
6) 70% of adults rely on digital calendar - ECAL
7) Bangladesh Imports from China of Electrical, electronic equipment - 2022 Data 2023 Forecast 1989-2015 Historical (tradingeconomics.com)
8) Meeting Bangladesh's Plastic Challenge through a Multisectoral Approach (worldbank.org)
9) E-waste management challenges in the country (thefinancialexpress.com.bd)