

## EEE 416 (July 2023)

Microprocessor and Embedded systems Laboratory

### Final Project Report

Section: C1 Group: 03

#### Bangla Notice Board with Calendar Clock

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#### Academic Honesty Statement:

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*"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."*

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# 1 Abstract

Our project, Bangla Notice Board with Calendar Clock uses an esp8266 module and LED dot matrix to implement scrolling of Bangla Notice, date and time. The goal of the project is to construct a Bangla Notice Board with time that is more visually appealing than earlier versions. The data that is shown on three screens is shared by our version.

Through Wi Fi, the NTP server provides the current time and date. In notice board we tried to show some definite and common Bangla notice that can be used in educational institutions or other such organisations. This project has two goals. First, it collects time date from NTP server through the RTC module in esp8266. Then in LED dot matrix Bangla notice automatically scrolls and can be updated via a website.

## 2 Introduction

English date, time and notice board implementation using LED dot matrix is quite common. But implementation of it in Bangla is rarely seen. Bangla notice board with calendar clock is an IoT device featuring Bangla LED dot matrix displays. The project is based on ESP8266 microcontroller and its prime function is to drive three led dot matrix displays at a time. The microprocessor also features Wi Fi connectivity allowing it to connect to the internet and work as an IoT device. It collects time and date data from online servers, updates regularly and works flawlessly. The physical dimensions of the project is somewhat compact and easy mountable. Our objective of this project was to implement not only the Bangla time and date but also use the dot matrix as a display board to show notice or any other kind of messages. The date and time can be accessed from the NTP server through the RTC module in esp8266. We also designed an enclosure for the total system which can hold the 3 LED dot matrix displays, the ESP8266 and the power supply.

## 3 Design

### 3.1 Problem Formulation (PO(b))

#### 3.1.1 Identification of Scope

##### 1. Hardware Components Selection:

- Identify suitable hardware components such as display screens, microcontrollers, and sensors that can accommodate Bangla text rendering and time/date display functionalities.
- Ensure compatibility and feasibility of integration within the notice board system.

##### 2. Bangla Text Rendering:

- Focus on developing software algorithms capable of accurately rendering Bangla text on digital displays.
- Ensure legibility and readability of Bangla characters by bitmapping and updating that into Arduino library

##### 3. Clock System & Calendar Integration:

- Develop a clock system synchronized with standard timekeeping protocols to display current time accurately.
- Ensure compatibility with the chosen hardware components and software architecture

- Implement a calendar feature to display the current date and month in Bangla.
4. **User Interface Design:**
    - Design a user-friendly interface that allows easy navigation and interaction with the notice board, clock, and calendar functionalities.
    - Consider usability principles to ensure accessibility for users with varying levels of technical proficiency.
  5. **Customization Options:**
    - Provide users with the ability to input and display custom notices and messages on the notice board.
    - Include features for users to customize the appearance and layout of displayed information according to their preferences.
  6. **Testing and Quality Assurance:**
    - Conduct rigorous testing to ensure the functionality, reliability, and accuracy of the notice board system.
    - Perform usability testing to gather feedback on user experience and identify areas for improvement.
  7. **Scalability and Future Expansion:**
    - Consider the potential for future expansion and scalability of the notice board system.
    - Design the architecture to accommodate additional features or upgrades based on user feedback and evolving requirements.
  8. **Project Constraints and Limitations:**
    - Recognize and address constraints such as budget limitations, technical challenges, and time constraints that may

### 3.1.2 Literature Review

Digital notice boards are increasingly used for information dissemination, but there's a gap in addressing the needs of Bangla-speaking communities. Research in Bangla language processing has advanced, focusing on efficient text rendering. However, there's limited literature on integrating Bangla language with time and date features in digital signage. Digital signage systems are effective for conveying information, but there's a lack of research on culturally sensitive design for localized solutions. Time and date integration in digital signage is common, improving user engagement.

This project aims to fill the gap by developing a Bangla notice board system integrating time and date features. It leverages insights from Bangla language processing and digital signage systems to create an inclusive communication solution for Bangla-speaking audiences.

### 3.1.3 Formulation of Problem

We aimed to achieve some specific goals by developing the project. The objectives include:

- Developing a digital Bangla Notice Board capable of displaying text in the Bangla language.
- Implementing a calendar functionality to display current date and month in Bangla.
- Integrating a clock system to display current time in digital format alongside the notice board and calendar.
- To ensure user-friendly interaction and navigation for easy access to notice board updates,

- calendar, and clock functionalities.
- To provide customization options

### 3.2 Design Method (PO(a))

We used ESP8266 board and connected it to the LED dot matrix and programmed the board to use it as a Bangla notice board and also show the date and time in Bangla. We configured the internal RTC module of esp8266 to access the NTP server to update date and time. The algorithm deployed in this project-

- Connecting to WiFi via WiFi Manager.h library interface
- Fetching data from NTP server
- Updating time on RTC
- Bitmapping Bangla characters using dot matrix tool
- Conversion of characters to Bangla using MD\_MAX72xx library
- Interfacing a website to show desired notices in Bangla
- Printing required data on screen using MD Parola library

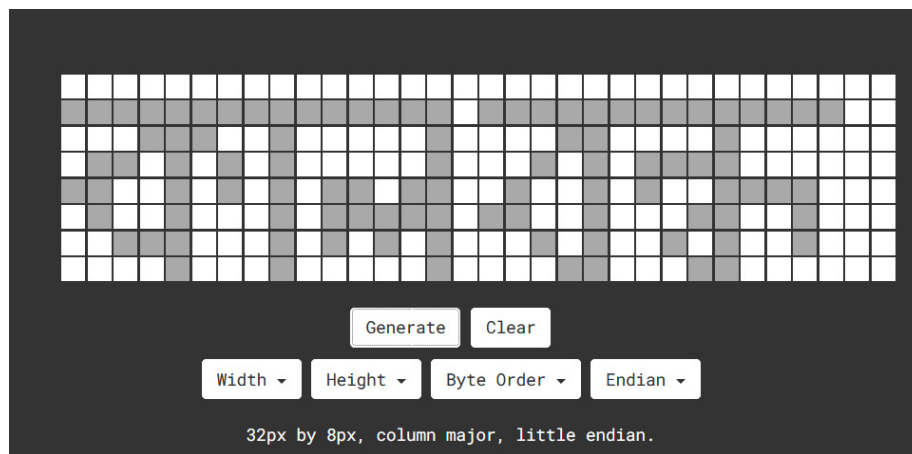


Fig.1. Bangla Notice in Dot Matrix Tool

### 3.3 Circuit Diagram

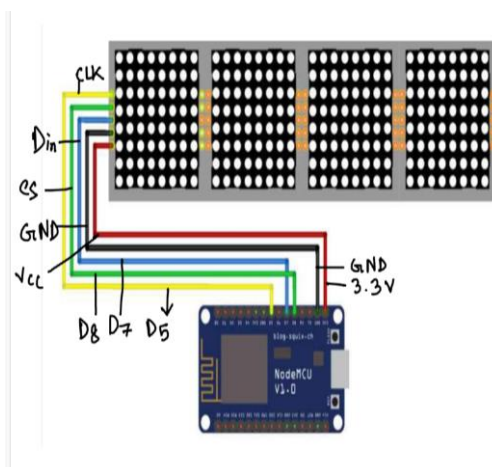


Fig.2. Connection of Notice Board display with Esp8266

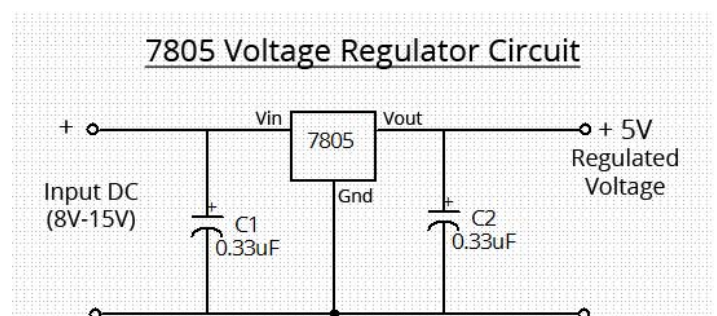


Fig.3. Voltage Regulation Circuit

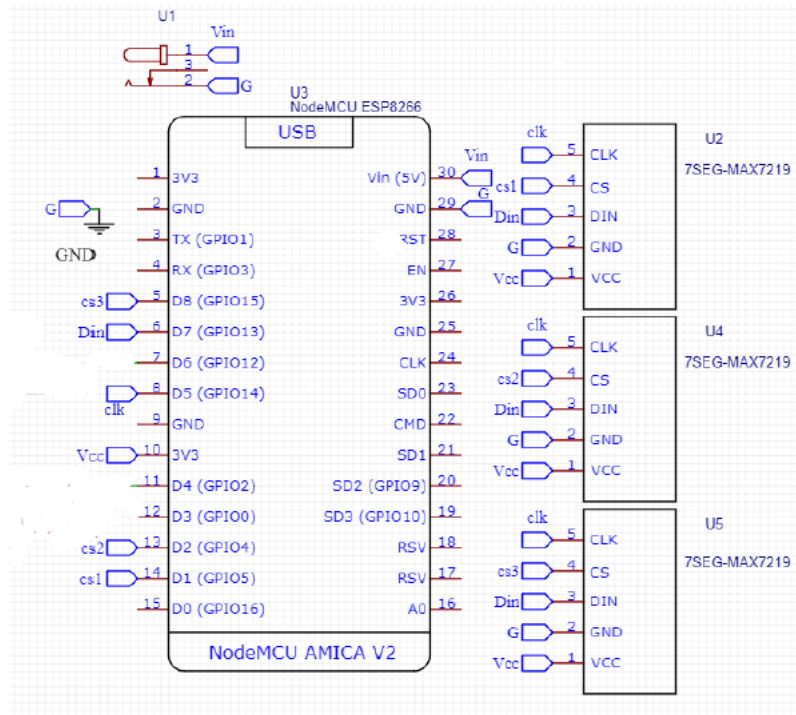


Fig.4. Connection of 3 displays with NodeMCU Esp8266

### 3.4 Full Source Code of Firmware

```
#include <ESP8266WiFi.h>
#include <WiFiUdp.h>
#include <WiFiManager.h>
#include <MD_Parola.h>
#include <MD_MAX72xx.h>
#include <SPI.h>
#include <TimeLib.h>
#include <Adafruit_GFX.h>
#include <Max72xxPanel.h>

#define DEBUG 0

#if DEBUG
#define PRINT(s, x) \
{ \
  Serial.print(F(s)); \
  Serial.print(x); \
}
#define PRINTS(x) Serial.print(F(x))
#define PRINTX(x) Serial.println(x, HEX)
#else
#define PRINT(s, x)
#define PRINTS(x)
#define PRINTX(x)
#endif

#define HARDWARE_TYPE MD_MAX72XX::FC16_HW
#define MAX_DEVICES 4

    } else if (date >= 15) {
      mash = 3;
      //name="Ashar";
      date = date - 15 + 1;
    }
  } else if (mash == 7) {

    if (date < 16) {
      mash = 3;
      //name="Ashar";
      date = date + 16;
    } else if (date >= 16) {
      mash = 4;
      //name="Srabon";
      date = date - 16 + 1;
    }
  } else if (mash == 8) {

    if (date < 16) {
      mash = 4;
      //name="Srabon";
      date = date + 16;
    } else if (date >= 16) {
      mash = 5;
      //name="Vadro";
      date = date - 16 + 1;
    }
  }
}
```

```

#define CLK_PIN 14 //D5
#define DATA_PIN 13 //D7
#define CS_PIN_TIME 0 //D3
#define CS_PIN_DATE 15 //D8
#define BUZZER_PIN 12 //D6
#define WIFI_TIMEOUT 10000
#define NTP_TIMEOUT 10000

#define CS_PIN 2 // or D4

// WiFi Server object and parameters
WiFiServer server(80);

// Scrolling parameters
uint8_t frameDelay = 25; // default frame delay value
textEffect_t scrollEffect = PA_SCROLL_LEFT;

int pinCS = 4; // Attach CS to D2, DIN to MOSI and CLK to SCK
int numberOfHorizontalDisplays = 4;
int numberOfVerticalDisplays = 1;

Max72xxPanel GD = Max72xxPanel(pinCS, numberOfHorizontalDisplays, numberOfVerticalDisplays);
MD_Parola P_time = MD_Parola(HARDWARE_TYPE, CS_PIN_TIME, MAX_DEVICES);
MD_Parola P_date = MD_Parola(HARDWARE_TYPE, CS_PIN_DATE, MAX_DEVICES);
MD_Parola P = MD_Parola(HARDWARE_TYPE, CS_PIN, MAX_DEVICES);

// Global message buffers shared by Wifi and Scrolling functions
#define BUF_SIZE 512
char curMessage[BUF_SIZE];
char newMessage[BUF_SIZE];
bool newMessageAvailable = false;

// WiFi login parameters - network name and password
const char* ssid = "Room 312";
const char* password = "19041655";

const char WebResponse[] = "HTTP/1.1 200 OK\nContent-Type: text/html\n\n";

const char WebPage[] =
"<!DOCTYPE html>" \
"<html>" \
"<head>" \
"<meta charset='UTF-8'>" \
"<title>MajicDesigns Test Page</title>" \
"<script>" \
"function SendData(message = '') {" \
"  var strLine = \"\";" \
"  var nocache = \"\"/&nocache=\" + Math.random() * 1000000;" \
"  var request = new XMLHttpRequest();" \
"  strLine = \"&MSG=\" + encodeURIComponent(message);" \
"  strLine += \"&SD=\" + document.getElementById(\"data_form\").ScrollType.value;" \
"  strLine += \"&I=\" + document.getElementById(\"data_form\").Invert.value;" \
"  strLine += \"&SP=\" + document.getElementById(\"data_form\").Speed.value;" \
"  request.open(\"GET\", strLine + nocache, false);" \
"  request.send(null);" \
"}" \
"</script>" \
"</head>" \
"<body>" \
"<p><b>Smart Notice Board</b></p>" \
"<form id='data_form' name='frmText'>" \
"<label>Message:<br><input type='text' id='Message' name='Message' maxlength='255'></label>" \
"<br><br>" \
"<input type='radio' name='Invert' value='0' checked> Normal" \
"<input type='radio' name='Invert' value='1'> Inverse" \
"<br>" \
"<input type='radio' name='ScrollType' value='L' checked> Left Scroll" \

```

```

} else if (mash == 9) {
  if (date < 16) {
    mash = 5;
    //name="Vadro";
    date = date + 16;
  } else if (date >= 16) {
    mash = 6;
    //name="Ashwin";
    date = date - 16 + 1;
  }
} else if (mash == 10) {
  if (date < 16) {
    mash = 6;
    //name="Aswin";
    date = date + 15;
  } else if (date >= 16) {
    mash = 7;
    //name="Kartik";
    date = date - 16 + 1;
  }
} else if (mash == 11) {
  if (date < 15) {
    mash = 7;
    //name="Kartik";
    date = date + 15 + 1;
  } else if (date >= 15) {
    mash = 8;
    //name="Agrahoyon";
    date = date - 15 + 1;
  }
} else if (mash == 12) {
  if (date < 15) {
    mash = 8;
    //name="Agrahoyon";
    date = date + 15 + 1;
  } else if (date >= 15) {
    mash = 9;
    //name="Poush";
    date = date - 15 + 1;
  }
} else if (mash == 1) {
  if (date < 14) {
    mash = 9;
    //name="Poush";
    date = date + 14 + 3;
  } else if (date >= 14) {
    mash = 10;
    //name="Magh";
    date = date - 14 + 1;
  }
}
if (date < 15) {
  mash = 2;
  //name="Joistha";
  date = date + 15 + 2;
} else if (mash == 2) {
  if (date < 13) {
    mash = 10;
    //name="Magh";
    date = date + 13 + 5;
  } else if (date >= 13) {
    mash = 11;
    //name="Falgun";
    date = date - 13 + 1;
  }
} else if (mash == 3) {
  if (date < 15) {
    mash = 11;
    //name="Falgun";
    date = date + 15 + 2;
  } else if (date >= 15) {
    mash = 12;
    //name="Chaitra";
    date = date - 15 + 1;
  }
}
}

```



<pre> &lt;input type = \"radio\" name = \"ScrollType\" value = \"R\"&gt; Right Scroll\" \ &lt;br&gt;&lt;br&gt;\" \ &lt;label&gt;Speed:&lt;br&gt;Fast&lt;input type= \"range\" name= \"Speed\" min= \"10\" max= \"200\"&gt;Slow&lt;/label&gt;\" \ &lt;br&gt;\" \ &lt;/form&gt;\" \ &lt;br&gt;\" \ &lt;input type= \"button\" value= \"সময় শেষ\" onclick= \"SendData('!')\"&gt;\" \ &lt;input type= \"button\" value= \"সিটি শুরু হবে\" onclick= \"SendData('+')\"&gt;\" \ &lt;input type= \"button\" value= \"কাল বন্ধ\" onclick= \"SendData('-')\"&gt;\" \ &lt;br&gt;\" \ &lt;input type= \"button\" value= \"এখন নামাযের বিরতি\" onclick= \"SendData('?')\"&gt;\" \ &lt;br&gt;\" \ &lt;input type= \"button\" value= \"ফযর শুরু\" onclick= \"SendData('q')\"&gt;\" \ &lt;br&gt;\" \ &lt;input type= \"button\" value= \"যোহর শুরু\" onclick= \"SendData('r')\"&gt;\" \ &lt;br&gt;\" \ &lt;input type= \"button\" value= \"আসর শুরু\" onclick= \"SendData('t')\"&gt;\" \ &lt;br&gt;\" \ &lt;input type= \"button\" value= \"আগে নামতে দিন\" onclick= \"SendData('u')\"&gt;\" \ &lt;/body&gt;\" \ &lt;/html&gt;\";  const char* err2Str(wl_status_t code) {     switch (code) {         case WL_IDLE_STATUS: return ("IDLE"); break;         // WiFi is in process of changing between statuses         case WL_NO_SSID_AVAIL: return ("NO_SSID_AVAIL");         break; // case configured SSID cannot be reached         case WL_CONNECTED: return ("CONNECTED"); break;         // successful connection is established         case WL_CONNECT_FAILED: return ("CONNECT_FAILED");         break; // password is incorrect         case WL_DISCONNECTED: return ("CONNECT_FAILED");         break; // module is not configured in station mode         default: return ("??");     } }  uint8_t htoi(char c) {     c = toupper(c);     if ((c &gt;= '0') &amp;&amp; (c &lt;= '9')) return (c - '0');     if ((c &gt;= 'A') &amp;&amp; (c &lt;= 'F')) return (c - 'A' + 0xa);     return (0); }  void getData(char* szMesg, uint16_t len) // Message may contain data for: // New text (/MSG=) // Scroll direction (/SD=) // Invert (/I=) // Speed (/SP=) {     char *pStart, *pEnd; // pointer to start and end of     text      // check text message     pStart = strstr(szMesg, "/MSG=");     if (pStart != NULL) {         char* psz = newMessage;          pStart += 6; // skip to start of data         pEnd = strstr(pStart, "/&amp;");          if (pEnd != NULL) {             while (pStart != pEnd) {                 if ((*pStart == '%') &amp;&amp; isxdigit(*(pStart + 1)))                     // replace %xx hex code with the ASCII                     character                     char c = 0;                     pStart++;                     c += (atoi(*pStart++) &lt;&lt; 4);                     c += htoi(*pStart++);                     *psz++ = c;                 } else </pre>	<pre> /*Serial.println("Function er vitore"); Serial.println(date); Serial.println(mash); Serial.println(bochor);*/ if (!konta) return date; else if (konta == 1) return mash; else return bochor; }  void setup() {     Serial.begin(57600);     PRINTS("\n[MD_Parola WiFi Message Display]\nType a message for the scrolling display from your internet browser");      GD.setIntensity(0); // Set brightness between 0     and 15     for (int i = 0; i &lt; numberOfHorizontalDisplays *     numberOfVerticalDisplays; i++) {         GD.setRotation(i, 1); // 1 stands for 90 degrees         clockwise     }      // Connect to WiFi with timeout     /*WiFi.begin(ssid, password);     unsigned long wifiStartTime = millis();     while (WiFi.status() != WL_CONNECTED &amp;&amp; millis() -     wifiStartTime &lt; WIFI_TIMEOUT) {         delay(1000);         Serial.println("Connecting to WiFi...");     }      if (WiFi.status() == WL_CONNECTED) {         Serial.println("Connected to WiFi!");     }     */     // for showing notice     P.begin();     P.setIntensity(0);     P.displayClear();     P.displaySuspend(false);     P.displayScroll(curMessage, PA_LEFT, scrollEffect,     frameDelay);      curMessage[0] = newMessage[0] = '\0';      WiFiManager wifiManager;     //wifiManager.autoConnect("BanglaClock 2.0");      // Connect to and initialise WiFi network     PRINT("\nConnecting to ", ssid);      WiFi.begin(ssid, password);      while (WiFi.status() != WL_CONNECTED) {         PRINT("\n", err2Str(WiFi.status()));         delay(500);     }     PRINTS("\nWiFi connected");      // Start the server     server.begin();     PRINTS("\nServer started");      // Set up first message as the IP address     sprintf(curMessage, "%03d:%03d:%03d:%03d",     WiFi.localIP()[0], WiFi.localIP()[1],     WiFi.localIP()[2], WiFi.localIP()[3]);     PRINT("\nAssigned IP ", curMessage);     //ip     //Serial.println(curMessage);      configTime(timezoneOffset, 0,     ntpServerName); //change      unsigned long ntpStartTime = millis();     while (!time(nullptr) &amp;&amp; millis() - ntpStartTime &lt;     NTP_TIMEOUT) {         Serial.print(".");         delay(1000);     }     if (time(nullptr)) {         Serial.println("\nTime set!");         delay(1000);     } else { </pre>
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<pre>         *psz++ = *pStart++;     }      *psz = '\0'; // terminate the string     newMessageAvailable = (strlen(newMessage) != 0);     PRINT("\nNew Msg: ", newMessage); } }  // check scroll direction pStart = strstr(szMesg, "/&amp;SD="); if (pStart != NULL) {     pStart += 5; // skip to start of data      PRINT("\nScroll direction: ", *pStart);     scrollEffect = (*pStart == 'R' ? PA_SCROLL_RIGHT : PA_SCROLL_LEFT);     P_date.setTextEffect(scrollEffect, scrollEffect);     P_date.displayReset(); }  // check invert pStart = strstr(szMesg, "/&amp;I="); if (pStart != NULL) {     pStart += 4; // skip to start of data      PRINT("\nInvert mode: ", *pStart);     P_date.setInvert(*pStart == '1'); }  // check speed pStart = strstr(szMesg, "/&amp;SP="); if (pStart != NULL) {     pStart += 5; // skip to start of data      int16_t speed = atoi(pStart);     PRINT("\nSpeed: ", P.getSpeed());     P_date.setSpeed(speed);     frameDelay = speed; } }  void handleWiFi(void) {     static enum { S_IDLE,         S_WAIT_CONN,         S_READ,         S_EXTRACT,         S_RESPONSE,         S_DISCONN } state = S_IDLE;      static char szBuf[1024];     static uint16_t idxBuf = 0;     static WiFiClient client;     static uint32_t timeStart;      switch (state) {         case S_IDLE: // initialise             PRINTS("\nS_IDLE");             idxBuf = 0;             state = S_WAIT_CONN;             break;          case S_WAIT_CONN: // waiting for connection             {                 client = server.available();                 if (!client) break;                 if (!client.connected()) break;  #ifdef DEBUG                 char szTxt[20];                 sprintf(szTxt, "%03d:%03d:%03d:%03d", client.remoteIP()[0], client.remoteIP()[1], client.remoteIP()[2], client.remoteIP()[3]);                 PRINT("\nNew client @ ", szTxt); #endif                  timeStart = millis();                 state = S_READ;             }             break;          case S_READ: // get the first line of data             PRINTS("\nS_READ ");              while (client.available()) {                 char c = client.read(); </pre>	<pre>         Serial.println("\nFailed to get NTP time. Using last known time.");         delay(1000);     }      P_time.begin();     P_date.begin();      P_time.setIntensity(0); // Set the brightness to a visible level     P_date.setIntensity(0); // Set the brightness to a visible level      pinMode(BUZZER_PIN, OUTPUT); }  char ip[100];  void loop() {     handleWiFi();      if (P.displayAnimate())     {         Serial.println(curMessage);         delay(1000);         if (newMessageAvailable)         {             strcpy(curMessage, newMessage);             newMessageAvailable = false;         }          P.displayReset();          // Set up first message as the IP address         sprintf(ip, "%03d:%03d:%03d:%03d", WiFi.localIP()[0], WiFi.localIP()[1], WiFi.localIP()[2], WiFi.localIP()[3]);         Serial.println(ip);         delay(1000);     }      time_t now = time(nullptr) + timezoneOffset;     int hours = hour(now);     if (hours &gt; 12) {         hours = hours - 12;     }      if (hours == 0)         hours = 12;     int minutes = minute(now);     int seconds = second(now);      if (minutes==0&amp;&amp;hours==0)         digitalWrite(BUZZER_PIN, HIGH);     else         digitalWrite(BUZZER_PIN, LOW);      char timeStr[9];     if (seconds % 2 == 1) {         if ((minutes % 10 == 1    minutes % 10 == 2    minutes % 10 == 0    minutes / 10 == 1    minutes / 10 == 2    minutes / 10 == 0) &amp;&amp; hours &gt; 2)             sprintf(timeStr, "%d:%02d", hours, minutes);         else             sprintf(timeStr, " %d:%02d", hours, minutes);     } else {         if (minutes % 10 == 1    minutes % 10 == 2    minutes % 10 == 0    minutes / 10 == 1    minutes / 10 == 2    minutes / 10 == 0)             sprintf(timeStr, "%d %02d", hours, minutes);         else             sprintf(timeStr, " %d %02d", hours, minutes);     }      Serial.println(timeStr);     delay(10000);      P_time.displayClear();     P_time.displayZoneText(0, timeStr, PA_CENTER, 0, 0, PA_PRINT, PA_NO_EFFECT); </pre>
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<pre>         if ((c == '\r')    (c == '\n')) {             szBuf[idxBuf] = '\0';             client.flush();             PRINT("\nRecv: ", szBuf);             state = S_EXTRACT;         } else             szBuf[idxBuf++] = (char)c;     }     if (millis() - timeStart &gt; 1000) {         PRINTS("\nWait timeout");         state = S_DISCONN;     }     break;  case S_EXTRACT: // extract data     PRINTS("\nS_EXTRACT");     // Extract the string from the message if there is one    getData(szBuf, BUF_SIZE);     state = S_RESPONSE;     break;  case S_RESPONSE: // send the response to the client     PRINTS("\nS_RESPONSE");     // Return the response to the client (web page)     client.print(WebResponse);     client.print(WebPage);     state = S_DISCONN;     break;  case S_DISCONN: // disconnect client     PRINTS("\nS_DISCONN");     client.flush();     client.stop();     state = S_IDLE;     break;  default: state = S_IDLE; } }  const char* ntpServerName = "pool.ntp.org"; const long timezoneOffset = 6 * 3600; // 6 hours converted to seconds const char* gMonthNames[] = { "", "JAN", "FEB", "MAR", "APR", "MAY", "JUN", "JUL", "AUG", "SEP", "OCT", "NOV", "DEC" }; const char* monthNames[] = { "", "b", "j", "a", "g", "d", "e", "k", "o", "p", "m", "f", "c" }; const char* weekNames[] = { "", "\$", "%", "&amp;", "(, ", ")", "*", "#" }; const char* weeks[] = { "", " SUN", " MON", " TUE", " WED", " THU", " FRI", " SAT" };  int conv2bangla(int date, int mash, int bochor, int konta) {      if (mash &gt;= 4 &amp;&amp; mash &lt;= 12) {         bochor = bochor - 593;     } else {         bochor = bochor - 1 - 593;     }      if (mash == 4) {          if (bochor &lt; 14) {             mash = 12;             //name="Chaitra";             date = date + 14 + 3;         } else if (date &gt;= 14) {              mash = 1;             //name="Boishakh";             date = date - 14 + 1;         }      }      } else if (mash == 5) {          if (date &lt; 15) {             mash = 1;             //name="Boishakh";             date = date + 15 + 2;         } else if (date &gt;= 15) {             mash = 2; </pre>	<pre> P_time.displayAnimate();  int gDay = day(now); int gMonth = month(now); int gYear = year(now); int weekDay = weekday(now);  char gDateStr[15]; // Enough space for day, month abbreviation, and year sprintf(gDateStr, "%d%s", gDay, gMonthNames[gMonth]);  Serial.println(gDateStr); delay(10000);  Serial.println(gYear); delay(10000);  Serial.println(weekDay); delay(10000);  if (seconds % 4 == 0    seconds % 4 == 1) {     GD.fillScreen(Low);     GD.setCursor(0, 1);     GD.print(gDateStr);     GD.write(); }  else {     GD.fillScreen(Low);     GD.setCursor(0, 1);     GD.print(weeks[weekDay]);     GD.write(); }  int bDay = conv2bangla(gDay, gMonth, gYear, 0); int bMonth = conv2bangla(gDay, gMonth, gYear, 1); int bYear = conv2bangla(gDay, gMonth, gYear, 2);  char dateStr[15]; // Enough space for day, month abbreviation, and year sprintf(dateStr, "%d%s", bDay, monthNames[bMonth]);  Serial.println(dateStr); delay(10000);  Serial.println(bYear); delay(10000);  if (P_date.displayAnimate()) {     if (newMessageAvailable) {         strcpy(curMessage, newMessage);         newMessageAvailable = false;     }     P_date.displayReset(); }  else {      if (seconds % 4 == 2    seconds % 4 == 3) {         P_date.displayClear();         P_date.displayZoneText(0, weekNames[weekDay], PA_CENTER, 0, 0, PA_PRINT, PA_NO_EFFECT);         P_date.displayAnimate();     }      else {         P_date.displayClear();         P_date.displayZoneText(0, dateStr, PA_CENTER, 0, 0, PA_PRINT, PA_NO_EFFECT);         P_date.displayAnimate();     }  }  } </pre>
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```
//name="Joistha";
date = date - 15 + 1;
}

} else if (mash == 6) {
```

Table: Source Code for the main program

## 4 Implementation

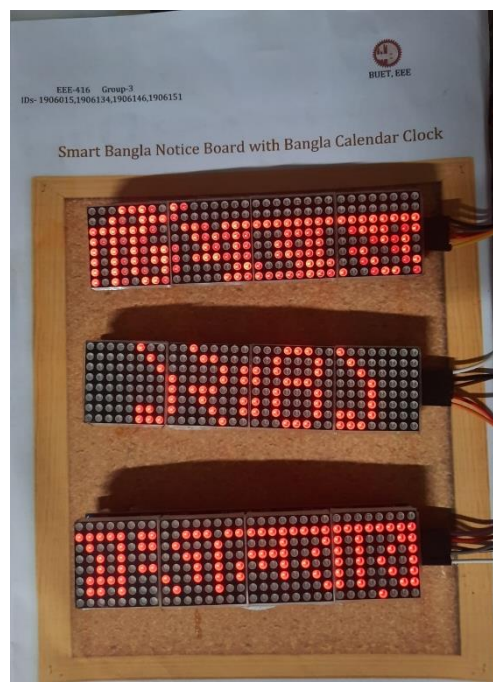
### 4.1 Description

We implemented the project in in ESP8266 board. We used a total of three LED dot matrix display to show our results. The topmost display shows notice messages which can be updated manually using a website we designed. And for making a convenient user interface, we added buttons for some common useful messages. The next two displays the date and time in English. The code uses the internal RTC module of the esp8266 board to update date and time from the NTP server. The microprocessor also features WiFi connectivity allowing it to connect to the internet and work as an IoT device. It collects time and date data from online servers, updates regularly and works flawlessly. The practical considerations of the design are-

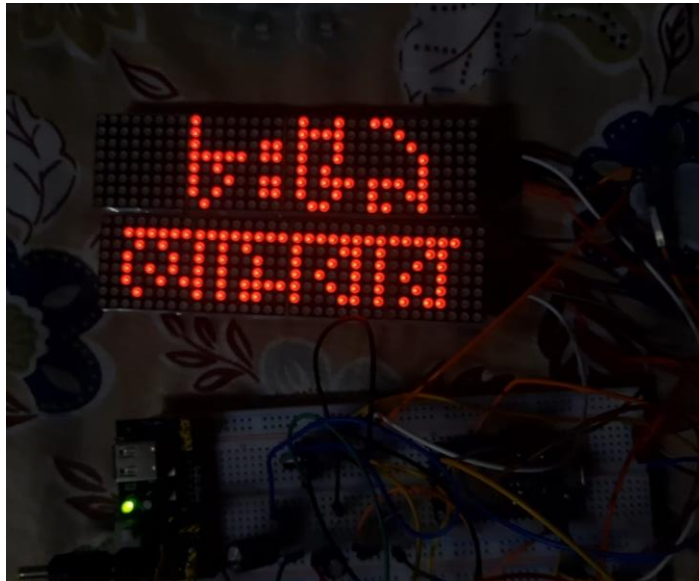
- Suitable for placement on both tables and walls
- Affordable
- Could have been more cost affective if custom-made multi-segment display was used
- The designed website can be conveniently accessed using a smart phone

### 4.2 Results

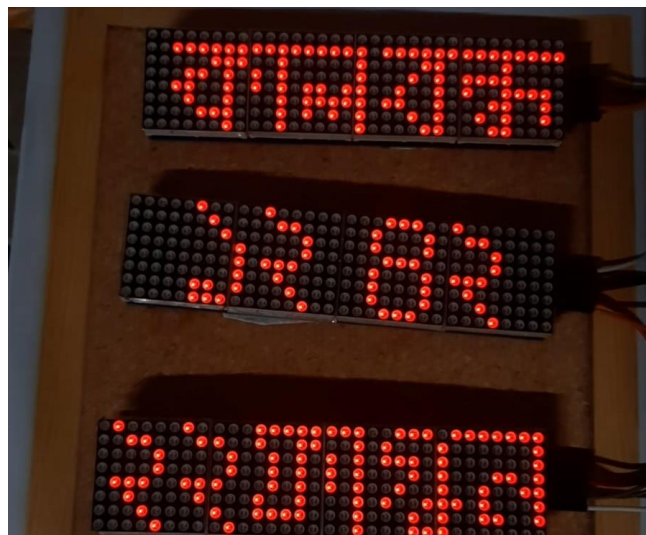
**Full view:**



### Bangla Time & Bangla day:



### Bangla Notice with Time & Date:



## 5 Design Analysis and Evaluation

### 5.1 Novelty

This work is novel as most of the required specifications are achieved and this can be implemented in practical life. The unique features of this project are-

- Improved fonts and visual
- Compact design
- Cheaper Hardware

### 5.2 Design Considerations (PO(c))

#### 5.2.1 Considerations to public health and safety

**Electrical Safety:** We ensured all electrical components meet safety standards to prevent hazards.

**Structural Stability:** Securely mount hardware to prevent accidents.

**Accessibility:** Design for easy access by users of all abilities.

#### 5.2.2 Considerations to environment

As long as we handle the power source and equipment properly by recycling and managing them well, this project won't harm the environment.

#### 5.2.3 Considerations to cultural and societal needs

In designing the Bangla Notice Board with Time and Date Integration, it's essential to respect the cultural and societal needs of Bangla-speaking communities. This includes accurately representing the Bangla language and script, incorporating culturally relevant content and events, ensuring accessibility for all users, and respecting social norms and etiquette. Collaborating with local stakeholders, engaging community participation, and providing educational opportunities can further empower and unite the community through the notice board. By prioritizing inclusivity, diversity, and cultural sensitivity, the project can effectively serve as a platform for communication, celebration, and empowerment within Bangla-speaking communities.

### 5.3 Limitations of Tools (PO(e))

- Deficiency of voltage in displays.
- Front bitmapping and padding.
- Date and time synchronization.
- Single board implementation.



- UI design
- PCB design
- Custom kit design

## **5.4 Impact Assessment (PO(f))**

### **5.4.1 Assessment of Societal and Cultural Issues**

By displaying the date and time in Bangla on the notice board, this project helps Bangla speakers stay informed and connected to their language. It encourages using Bangla in everyday life, boosting cultural pride and participation. By making technology more accessible in Bangla, this initiative supports community unity and empowerment.

### **5.4.2 Assessment of Health and Safety Issues**

This project doesn't pose any risks to public health and safety as long as we handle the power source and equipment responsibly, making sure to recycle and manage them properly.

### **5.4.3 Assessment of Legal Issues**

Legal considerations include ensuring compliance with intellectual property laws for software and fonts, adhering to data privacy regulations for user data protection, following accessibility standards, and obtaining necessary permits for installation. By addressing these legal issues, the project is secured from any legal risks.

## **5.5 Sustainability Evaluation (PO(g))**

The environmental impact is assessed by optimizing energy efficiency and reducing electronic waste. The social impact is evaluated by promoting cultural preservation and community engagement. Economic viability is ensured through cost-benefit analysis for building the project in a cost effective manner. There is scope for technological innovation and scalability for future upgrades. By enhancing community participation, we can monitor long-term impact for sustainability.

## **6 Reflection on Individual and Team work (PO(i))**

### **6.1 Individual Contribution of Each Member**

We worked together as a team. Each member contributed to bitmapping, code writing, error debugging and hardware assembly. Every time we faced any challenge we overcame that collaboratively.

## 6.2 Mode of TeamWork

We did several online zoom meetings to come up with the design procedure and share resources to explore already existing works for smart notice boards and calendar clocks in English. Then we worked day and night in the hall to assemble the whole project and finally successfully implement it.

## 6.3 Diversity Statement of Team

## 6.4 Log Book of Project Implementation

Date	Milestone achieved	Individual Role	Team Role	Comments
26.01.2024	Code written and uploaded for English Notice Board	1906015 provided a code link 1906146 gave the circuit connection 1906151 checked the connection 1906134 checked the code	Observed the outcome and did debugging together	-----
9.02.2024	Bitmapping for Bangla Notices	Each of the members did bitmapping for different notices	-----	-----
11.02.2024	Bangla Scrolling Notice observed by modifying the code	-----	Done collaboratively	Faced issues with power supply, esp8266 burnt, led display keeps being red
26.02.2024	Bitmapping done for Bangla calendar clock	Each of the members did bitmapping for different characters	-----	-----
01.03.2024	Code done for calendar clock		Done together	
03.03.2024	Merging Notice Board with calendar clock	1906015 merged the code 1906146 came up with a voltage regulator circuit to solve power supply problem 1906151 gave connection 1906134 checked them	-----	Led display and power supply problem solved
04.03.2024	Final assembly done		Done collaboratively	

## 7 Communication to External Stakeholders (PO(j))

### 7.1 Executive Summary

The Bangla Notice Board with Time and Date Integration project aims to develop a digital notice board system tailored for Bangla-speaking communities, providing essential time and date information in Bangla script. By leveraging technology to address cultural communication needs, the



project promotes inclusivity and accessibility while fostering cultural pride and language preservation. Key features include accurate Bangla text rendering, synchronized clock and calendar functionalities, and user-friendly customization options. Through compliance with legal regulations, sustainability considerations, and a focus on community engagement, the project seeks to minimize risks and maximize positive impact. By enhancing communication and information dissemination within Bangla-speaking communities, the project contributes to empowerment, unity, and cultural sustainability.

## 7.2 User Manual

- a) Turn on the board by connecting the adapter to the power supply.
- b) Wait for the screen to stabilize and show an IP address in the topmost screen for notice.
- c) Type the address in the browser of any smartphone or laptop to open the interfacing website.
- d) In the website, there are buttons for some common notices and a section for customized notices. Choose from the options to show the desired notice.
- e) The bottom two screens will keep showing the date and time in Bangla.

## 7.3 Github Link

[https://github.com/mongoose-os-libs/arduino-md-parola/blob/master/include/MD\\_Parola.h](https://github.com/mongoose-os-libs/arduino-md-parola/blob/master/include/MD_Parola.h)  
<https://github.com/markruys/arduino-Max72xxPanel>  
<https://github.com/tzapu/WiFiManager>  
[https://github.com/MajicDesigns/MD\\_MAX72XX](https://github.com/MajicDesigns/MD_MAX72XX)

# 8 Project Management and Cost Analysis (PO(k))

## 8.1 Bill of Materials

ESP NODE	420 Tk
MCU	
LED dot matrix	1950 Tk
LM 7805	20 Tk
Design	180 Tk
Power adapter	150 Tk
AC to DC converter	350 Tk
Capacitances	30 Tk
Total	3,100 Tk

## 9 Future Work (PO(l))

In this project we weren't able to add the feature of typing any Bangla Notice that will be shown in LED display. Instead we made buttons for some common messages from where notices can be

selected. So adding this feature is one of the most important future works for this project. To do so, Bitmappin each and every character in Bangla is needed which is a very gruesome task and it was not possible to do that within the time available in single semester. Also the date and time cannot be updated manually, it updates automatically from the server through wifi. Moreover, the board can be programmed to implement many other interesting display effects while showing the date and time

## 10 References

<https://dotmatrixtool.com/>

[www.github.com/VirusProton/Bangla-Calendar-Clock/](https://www.github.com/VirusProton/Bangla-Calendar-Clock/)

NTP Servers in Bangladesh, [bd.pool.ntp.org](http://bd.pool.ntp.org) ([ntppool.org](http://ntppool.org))