EEE 416 – Microprocessor and Embedded Systems Laboratory

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Final Project Demonstration

IoT Based Bangla Calendar Clock

SUBMITTED BY – GROUP A2-2

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1. Abstract

In this project, we implemented a Digital Clock which displays the Current Time, Day Period and Weekday in Bangla and both English and Bangla calendar dates.

The clock also features a WiFi module that can synchronize the displayed time from the internet for providing accurate time and date information.

All information is displayed in Bangla Text, in comparison to other clock which uses English Fonts or Segmented Displays.

2. Introduction

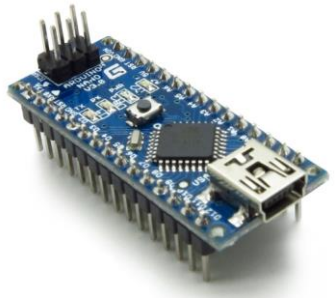
- In the recent times, we barely keep in touch with the bangla calendar, and as a result, apart from a few important date, Bangla calendar is all but forgotten.

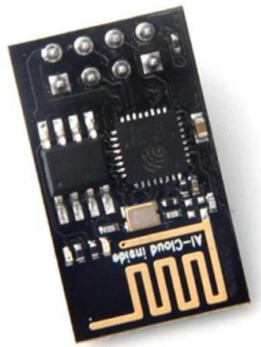
- In many rural areas, people still follow Bangla calendar for crop harvesting and various different festivities. Hence, sometimes it is necessary to keep up with various dates.

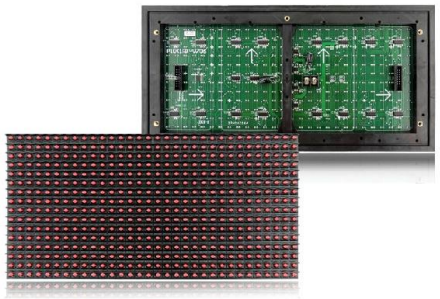
- A Bangla clock is necessary for people who are not comfortable or are not familiar with English digits and clocks

3.1 Design: Methods

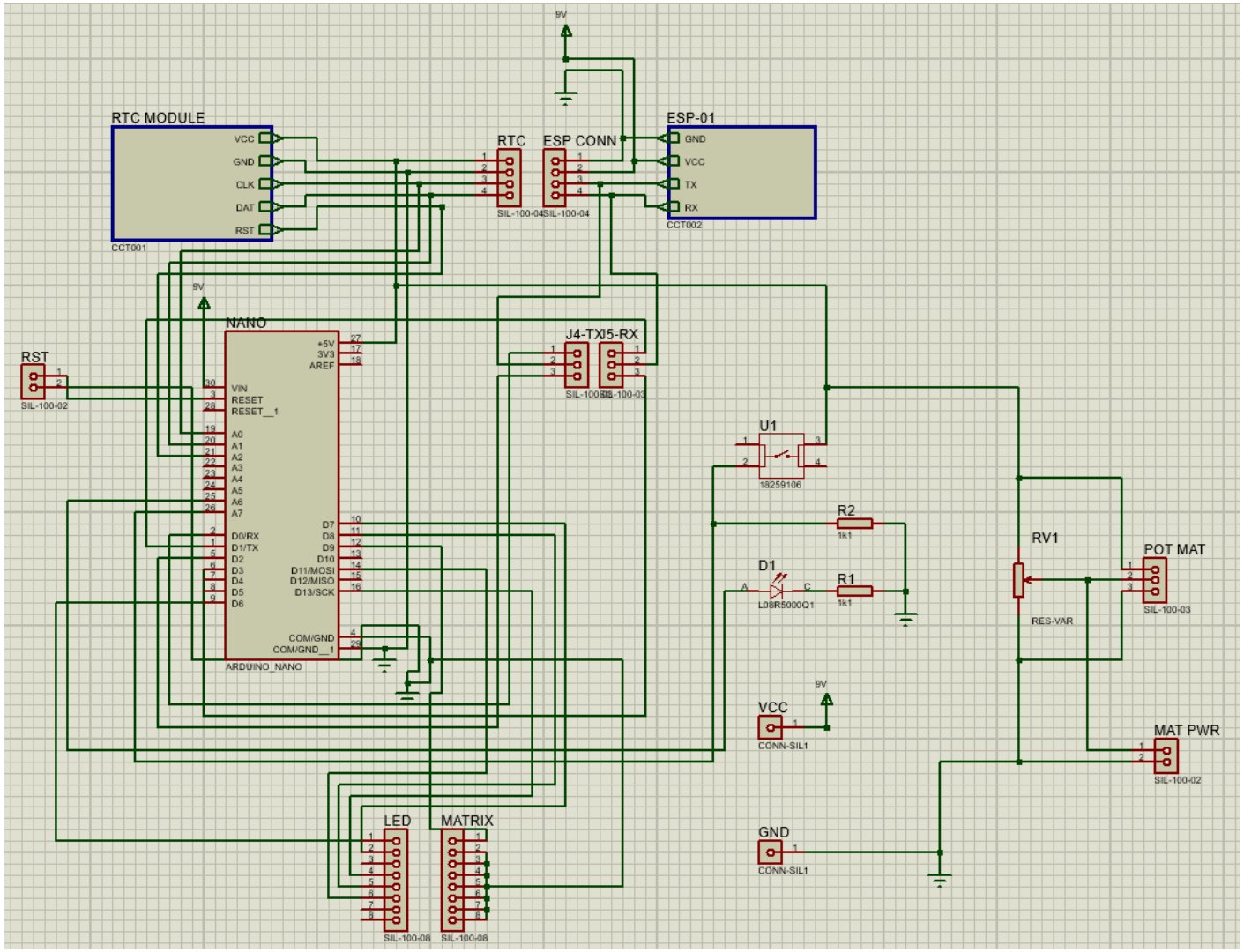
Microcontroller:
Arduino Nano (ATMega328p)
Peripheral Components:
DS1307 Real Time Clock(RTC) Module
ESP8266 ESP-01 WiFi Module
Display:
2 P10 32x16 LED Matrix Boards
Key Algorithms:
API Request, Serial and SPI Communications, Matrix Manipulation, String Parsing







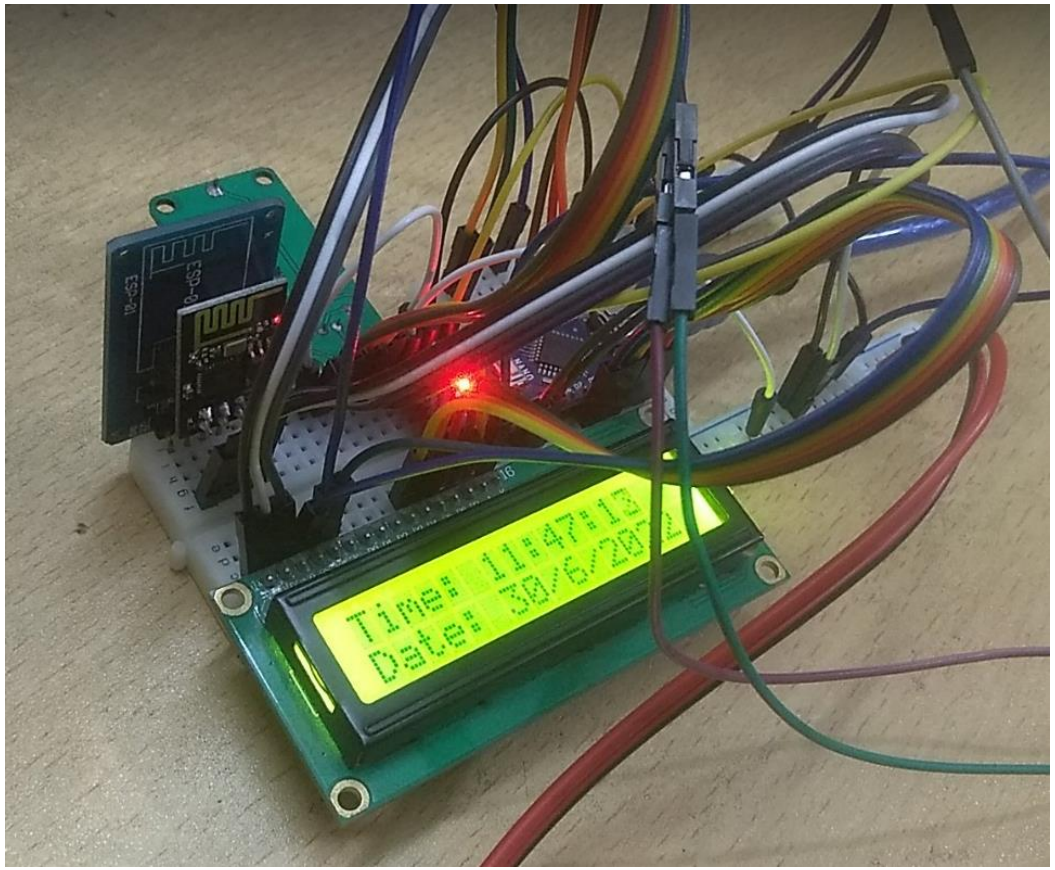
3.2 Design: Circuit Diagram



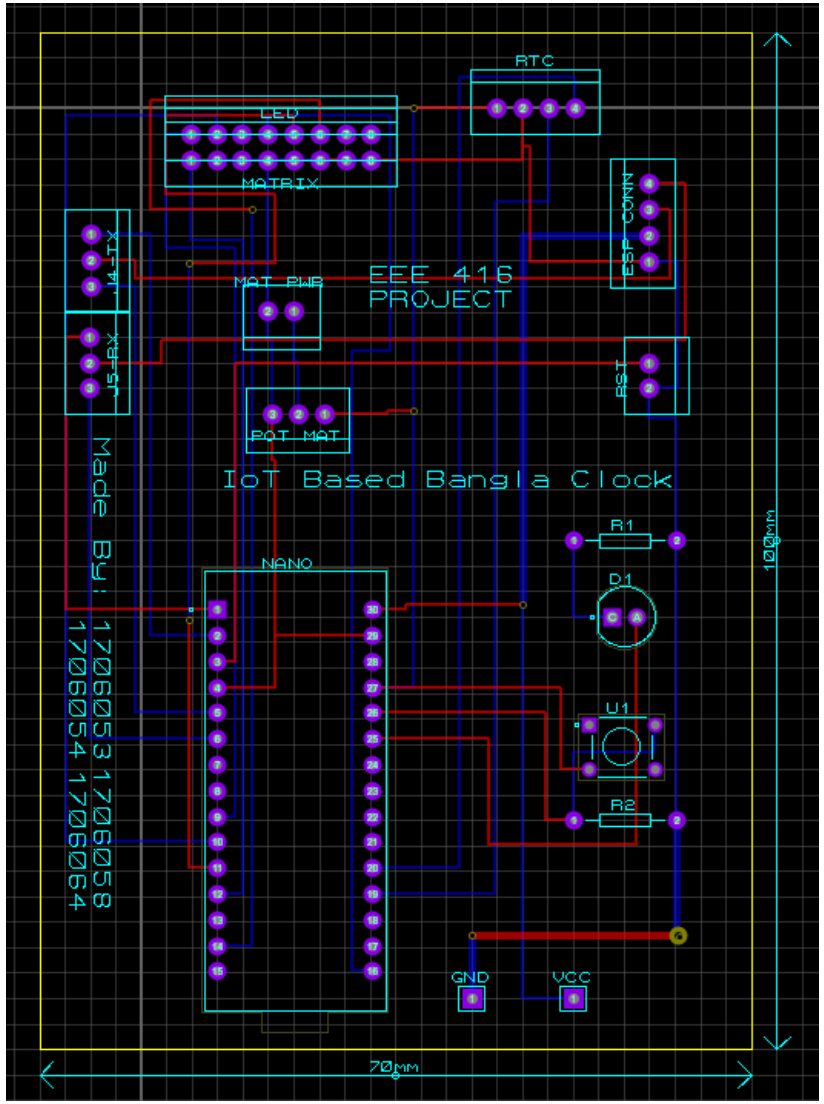
3.3 Design: Simulation

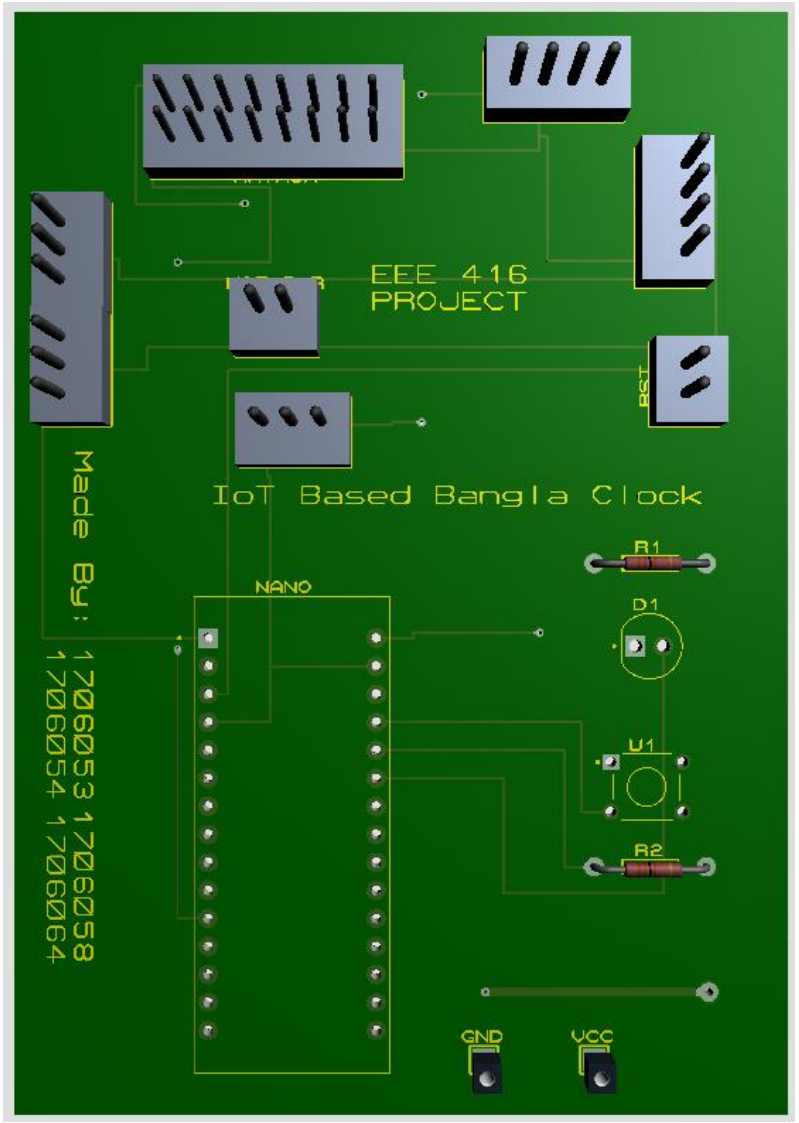
RTC Module and P10 LED Matrix Modules were not available in Proteus.

Therefore, initial prototyping of the circuit was done in breadboard before implementing the final setup in a PCB.

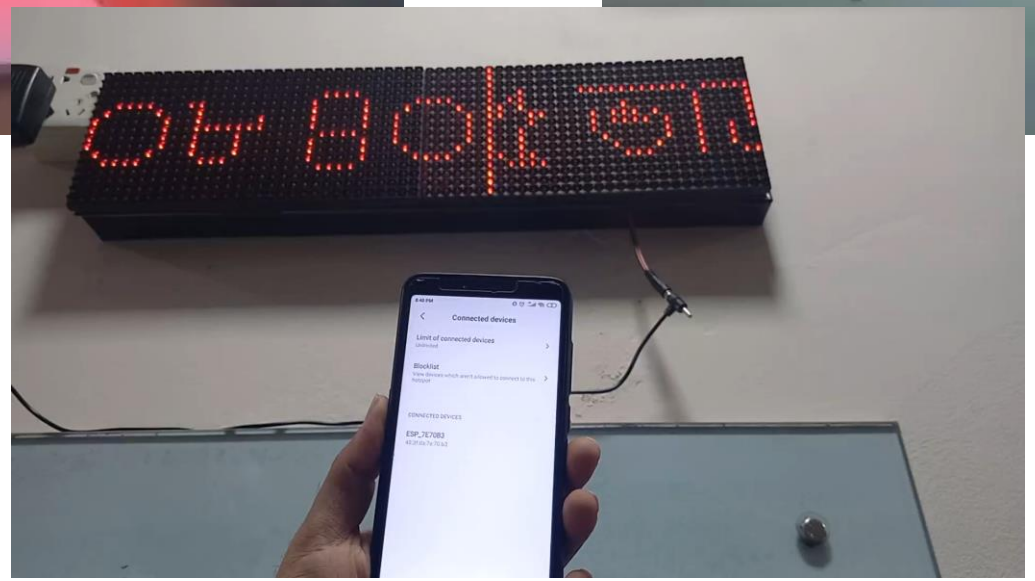


3.4 Design: PCB Layout and 3D Rendering

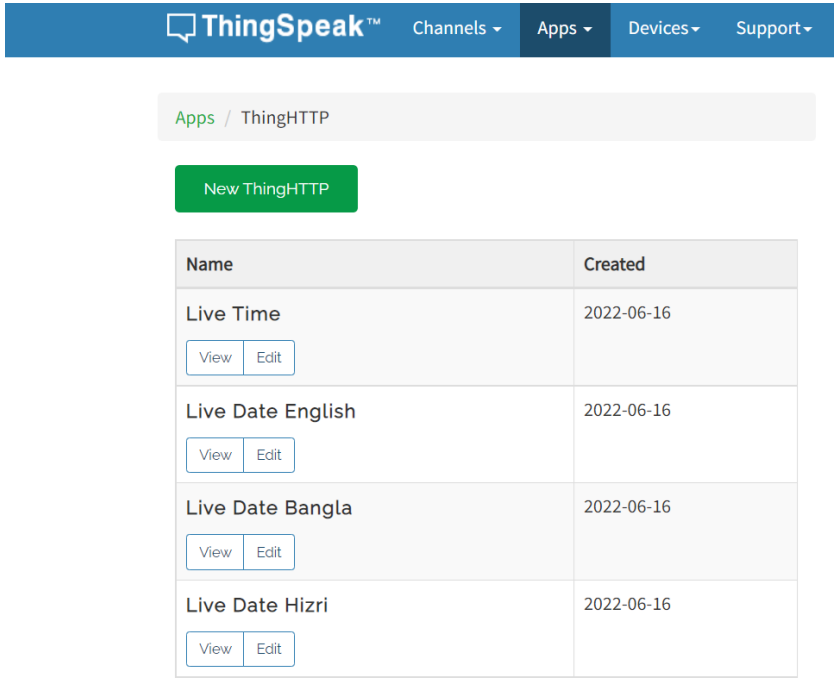




4 Implementation: Demonstration



4.1 Implementation: Photo Gallery



4.2 Implementation: External Links

- GitHub link:

  https://github.com/Sadat3366/EEE-416---Bangla-clock---Group-A2.2

- YouTube Link:
- https://youtu.be/6aywOkfDy6A

5. Analysis and Evaluation

- 5.1 Novelty
- 5.2 Project Management and Cost Analysis
- 5.3 Practical Considerations of the Design
- 5.4 Assessment of the Impact of the Project
- 5.5 Evaluation of the Sustainability

5.1 Novelty

- There have been previous designs of simple Bengali clock using 8x8 LED matrices and segmented displays commonly available in the market
- Incorporating Bengali and English date and months along with week days in Bengali font in a large wall-mountable p10 LED matrix assortment is a novel approach
- We have implemented a sturdy Bengali clock which in not commercially that available within affordable costs

5.2 Project Management and Cost Analysis

- Bill of Materials:

Name of Product	Unit Cost (Tk)	Amount	Total Cost (Tk)
P10 LED Matrix (32x16)	700	2	1400
Arduino Nano	720	1	720
RTC Module (DS1302)	190	1	190
ESP-8266 ESP-01 WiFi Module	200	1	200
ESP-01 Shield	110	1	110
9V Adapter and DC Jack	(120+30) = 150	1	150
Custom PCB Board	300	1	300
Soldering, Wires, Connectors and Headers	50	1	50
Metal Frame and Cover	(0+30) = 30	1	30
Total Cost	-	-	**3150**

Per unit cost of Product: 3150 Tk only

5.3 Practical Considerations of the Design

1. **Considerations to public health and safety**

The clock is enclosed safely in a metal casing that is welded in order to ensure maximum protection and a secure mounting mechanism is in place, so that the clock hangs from the wall securely without the risk of falling. Hence, making the device a very safe one.

2. **Considerations to environment**

No pollutant was reported

3. **Considerations to cultural and societal needs**

Bangla Calendar Clock represents and revives our mother language “Bangla”. It will hopefully help us to keep track of Bangla month and dates that we almost forget to use. We hardly can say which month or date today is according to Bangla calendar. Now, we can just look at the wall and stay updated with this neglected aspect of our tradition.

5.4 Assessment of the Impact of the Project

1. **Assessment of Societal Issues**

No social issues faced

2. **Assessment of Health and Safety Issues**

No health issues were reported at any stage of the product development, and no health issues were identified while using the device.

3. **Assessment of Legal Issues**

Our project has no patent infringements or copyright violations. Hence, we are safe in this regard.

4. **Assessment of Cultural Issues**

Our project promotes awareness about the Bengali culture and heritage, and has no issues regarding misrepresentation or appropriation of culture.

5.5 Evaluation of the Sustainability

1. **Evaluation of Sustainability**

We've developed the model with sustainability in mind. We wanted the clock to be reliable and strong. The metal casing is very sturdy and provides robust housing for the electrical parts inside. The module runs from the socket, therefore, there is no need for constantly changing batteries.

2. **Evaluation of Impact of Design in Societal Context**

The design is kept simple and compact using dark color and not too flashy. Similar clocks are very common in our local mosques and offices. So it can be used in our societal setting with ease.

3. **Evaluation of Impact of Design in Environmental Context**

Since we do not have to use large external batteries and have opted for long lasting materials, detrimental effects to environment are kept minimal.

6. Reflection on Individual and Team work

6.1 Individual Contribution of Each Member

6.2 Mode of TeamWork

6.3 Diversity Statement of Team

6.4 Logbook of Project Implementation

6.1 Individual Contribution of Each Member

- **Saleh Ahmed Khan - 1706053**
  - Establishing the WiFi link between Arduino and the Internet using ESP module, generating and maintaining the API requests for date and time in *ThingSpeak* website.
  - Leading PCB Design
- **Tiasa Mondal - 1706054**
  - Establishing communication between RTC module and the LED matrix, ensuring conflict free communication between the two modules.
  - hardware assembly
- **Abdullah Jubair Bin Iqbal - 1706058**
  - String Parsing to convert RTC and ESP module output to date and time integers for using in the display portion of the code
  - EEPROM implementation for storing Bengali date
- **Sadat Tahmeed Azad - 1706064**
  - Generating custom Bangla Fonts in the LED display. Displaying static and scrolling texts in runtime and incorporating display code with the rest
  - Frame design idea and management

6.2 Mode of TeamWork and Diversity

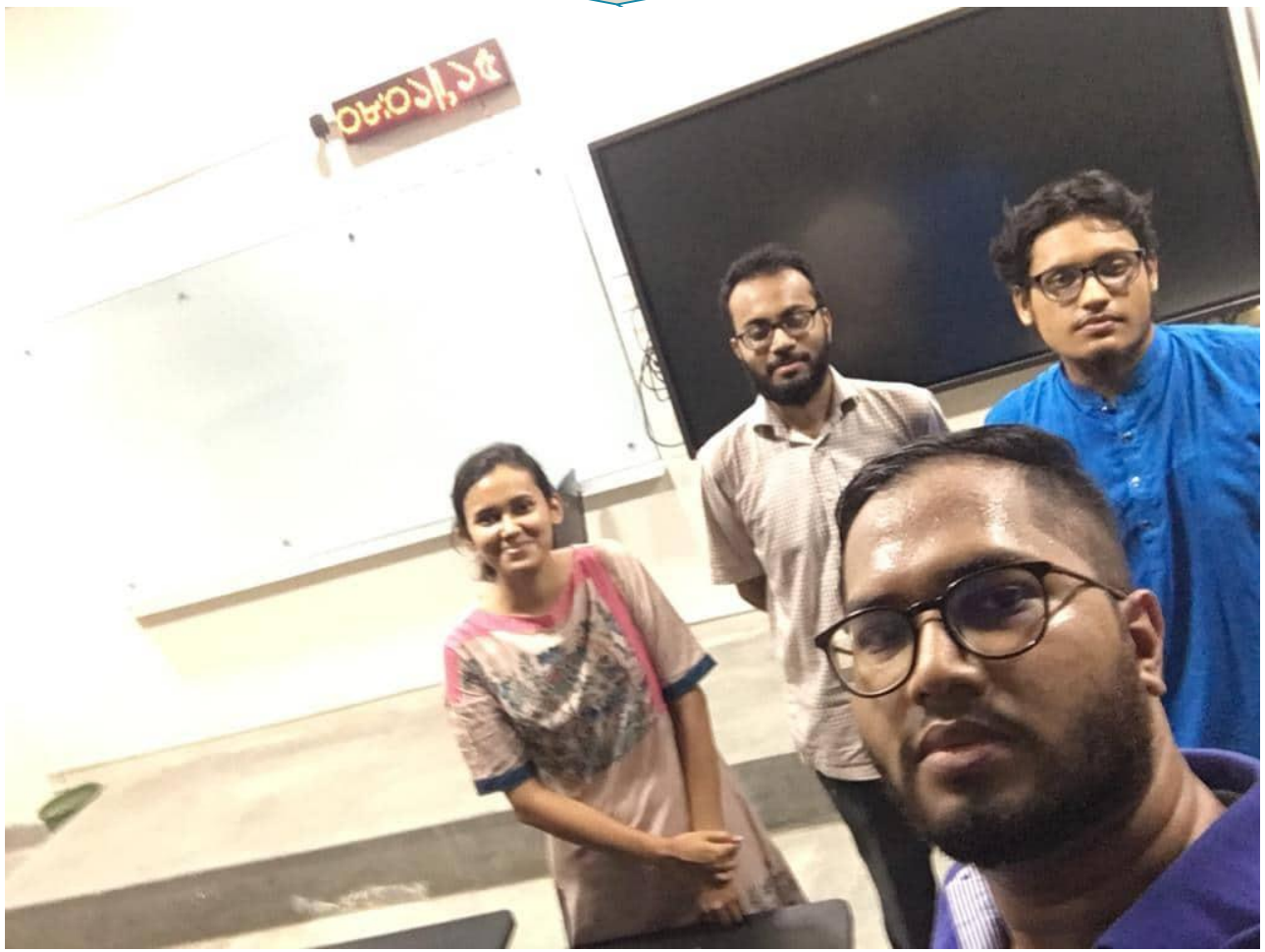
Though all of us divided our work primarily, we helped one another in other parts time to time to quicken the work and to keep the overall idea about our project. Saleh has always been the most focused member of the team, always pushing everyone to finish their tasks, after doing the heavy lifting himself. Tiasa has been immensely helpful in terms of debugging, searching for the appropriate parts, making sure that the hardware components are proper. Jubair has always been about efficiency and making the best use of everyone's time, always finding quicker and faster ways to solve any problem. Sadat has been the most approachable person of the group. Whenever there was an issue, we could all just reach out to him, and he would help us find a solution. All in all, it has been an amazing experience working together as a productive team.

6.3 Diversity Statement of Team

We have team members from different cultural and religious backgrounds. Our female team member Tiasa Mondal is based in Dhaka, while Sadat Tahmeed had his early education in suburban areas. The other members Abdullah Jubair and Saleh Ahmed Khan also spent their whole childhood in Dhaka. In our group, Tiasa is the extrovert, while Sadat, Saleh and Jubair were introverts. It has been quite a work experience for all of us. We have had our disagreements during the project work. Through collaboration and friendly interaction, we came to understand and settle our differences and find a common ground for successful teamwork

6.2 Mode of TeamWork and Diversity

Us with our Clock!



Working together was fun

6.3 Logbook of Project

6.4 Log Book of Project Implementation

Date	Milestone achieved	Individual Role	Team Role	Comments
9/6/22	Bengali & English months matrix formation	Sadat Tahmeed Azad generated custom Bangla Fonts in the LED display and displaying technique static and scrolling texts in runtime.	Months and times were divided among 4 members	Successfully done!
11/6/22	ESP-01 wifi module connection with Arduino and storage and date and time track using RTC and EEPROM in case of power cut	Saleh Ahmed Khan established the WiFi link between Arduino and the Internet using ESP module. Jubair Adib cnverted the date and time strings obained from online into proper integer variables to be used in the display code module designed by Sadat	Modified the code together	Successfully done
18/6/22	Working around module conflict	Tiasa Mondal figured out a way to establish comminucation betwe en RTC module and the LED matrix, ensuring conflict free incorporation of the two modules.		Running well enough
10/7/22	More issues resolved	Saleh resolved some issues related to flickering Adib incorporated EEPROM to use as backup storage for Bengali date in case Wifi is unavailable		Satisfactory performace
15/7/22	Successful trial text display on LED display	Tiasa Mondal,Saleh Ahmed Khan, Sadat Tahmeed Azad, Jubair Adib combined their parts to run the main code	All members solved error issues together	Successfully done
5/8/22	PCB design done	PCB design was devided among all members	All members checked different parts of the design and solved errors	Faced many issues but end of the day it worked out
20/8/22	Final clock framing	Everybody gathered some sort of information about wall clock framing.	Checked whether it will look proper or not	Feels good to see it all together

7. References

Youtube tutorials

1. [ESP8266] How to start with ESP-Connection with PC and checking functionality with AT commands

2. *how to use p10 led text display with arduino / p10 board with arduino / arduino p10 scrolling text*

3. How to Fetch data from any website using ESP8266 | IoT Projects

4. How to connect Arduino UNO to a WIFI Network: ESP8266 - AT Commands

Thank You for your kind attention!