American International University-Bangladesh (AIUB)

Department of Computer Science

Faculty of Science & Technology (FST)

PROJECT TITLE

A Software Engineering Project Submitted
By

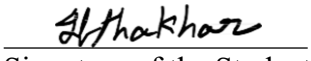
Semester: Summer_21_22		**Section:**	**Group Number:**	
SN	Student Name	Student ID	Contribution (CO3+CO4)	Individual Marks
1.	MD. TOWFIQ BIN HASAN	22-48732-3	1.1 Full 1.2(A,B) -Task 2.(1-5) -Task 5. Prototype UX Design 6. Test Case 1.1,1.2 & 5 7. Work Breakdown Structure.	
2.	ANIK, ZAHID HASAN TALUKDER	20-42284-1	1.2(C,D,E) 2.(6-9) 3.Use case diagram , 5.UX Design 6.Test Case 2.1,2.2 & 6 8.Gantt Chart	
3.	SHARMIN JAHAN	21-45869-3	1.2(F,G) 1.2(10-14) 4.Class diagram 6.Test Case 3,4 9.Risk Management	

The project will be Evaluated for the following Course Outcomes

CO3: *Select* appropriate software engineering models, project management roles and their associated skills for the complex software engineering project and evaluate the sustainability of developed software, taking into consideration the societal and environmental aspects	Total Marks	
Appropriate Process Model Selection and Argumentation with Evidence	[5 Marks]	
Evidence of Argumentation regarding process model selection	[5Marks]	
Evaluate the sustainability of the developed software in terms of both society and the environment (Impact identification)	[5Marks]	
Submission, Defense, Completeness, Spelling, grammar and Organization of the Project report	[5Marks]	
	Total Marks	
CO4: *Develop* project management plan to manage software engineering projects following the principles of engineering management and economic decision process		
Develop the project plan, its components of the proposed software products	[5Marks]	
Identify all the activities/tasks related to project management and categorize them within the WBS structure. Perform detailed effort estimation correspond with the WBS and schedule the activities with resources	[5Marks]	
Identify all the potential risks in the specific project and prioritizing/categorizing those to overcome the risk factors.	[5Marks]	

Description of Student's Contribution in the Project work

Student Name: MD IFTHAKHAR MAHMUD
Student ID: 20-42281-1
Contribution in Percentage (%): 35%
Contribution in the Project:
1.1 Full
1.2(A,B) -Task
2.(1-5) -Task
5. Prototype UX Design ,
6. Test Case 1.1,1.2 & 5
7. Work Breakdown Structure



Signature of the Student

Student Name: ANIK, ZAHID HASAN TALUKDER
Student ID: 20-42284-1
Contribution in Percentage (%): 35%
Contribution in the Project:
1.2(C,D,E)
2.(6-9)
3.Use case diagram,
5.UX Design ,
6.Test Case 2.1,2.2 & 6
8.Gantt Chart:

Zahid hasan
Signature of the Student

Student Name: SHARMIN JAHAN
Student ID: 21-45869-3
Contribution in Percentage (%): 35%
Contribution in the Project:
1.2(F,G)
1.2(10-14)
4.Class diagram
6.Test Case 3,4
9.Risk Management

Sharmin Jahan
Signature of the Student

RAILWAY ANTI-COLLISION SYSTEM IN BANGLADESH

1. PROJECT PROPOSAL

1.1 Project Description:

- **Write the background description that helps putting our project into the right context of a problem domain and gives everyone involved a common view of the project.**

Bangladesh's railway system is one of its many public transportation options. Thus, it has recently been involved in several collisions that have caused thousands of deaths and injuries. There's a very small room to blame the system because of its manual operations. The illegal removal of fish plates and collisions on the same track causes crashes. In our proposed system, (1) we monitor the tracks traffic flow via GPS for better transition, (2) we detect trains on the same track via GPS, (3) we monitor the fish plates using power relays. Any unusual train movement or the removal of fish plates will be detected, and the control room and train

dispatcher will be informed so that appropriate action can be taken. o **What is the root cause of this problem? Why this problem is so important to consider?**

There are mainly 3 root causes of this problem.

1. Unwanted congestion on railway tracks
2. More than 1 train on a track
3. Removal of fish plates

Trains are still manually operated on Bangladesh Railway. As a result, if we rely solely on visual information, it is already too late to act. For a train to brake, at least half a mile is required. Therefore, it is impossible to prevent accidents at that moment if a train operator observes another train approaching on the same track. The removal of fish plates and tracks is not currently being observed either. A railway dispatcher cannot guarantee a train's safe trip if they are unaware of whether the tracks are safe or not.

1.2 Solution to the Problem

- **(A) Describe what is our project/thesis objective? What solutions are you going to provide to solve the above-mentioned problems?**

The solutions we are going to provide are,

1. Prevention of Head-on, Rear-end or side collisions by automatic braking system.
2. GPS Tracking to monitor railway flows and abnormal train movement.
3. Providing necessary information to the train dispatchers.
4. Notifying train engineer about unusual movement of trains.
5. Monitoring of fish plates.

- **(B) What are the solutions you are going to propose to deal with the problem? why is this solution is particularly appropriate to solve the problem? Is the solution feasible to the meet the business objective?**

The solutions we will offer are as follows:

1. Automatic braking systems prevent head-on, rear-end, and side collisions.
2. GPS tracking, used to monitor railway flows and unusual train movement.
3. Providing critical information to train dispatchers.
4. Notifying the train engineer of unusual train movement.
5. Monitoring of fish plates.

- **(C) Describe the basic functionalities of our proposed solution that makes the best use of state-of-art technology and produced a significant result that is likely to have a major impact on societal, health, safety, legal and cultural issues. Provide a deep insight that demonstrate and preset a creative solution to the real-life problem.**

The basic functionalities of our proposed solutions are Safe Journey, Automatic braking, Providing necessary information's to the control room and corresponding People of a

station, Train congestion management. Our project will use the best use of the technology like Machine learning and Artificial Intelligence to handle critical situations. Support to Desktop and Mobile applications to make the process easier. This whole system will make very significant impact on real life. For example, Accident rates will fall dramatically, The system's proper use will ensure safe travel, Railway can control the proper flow of trains.

- **(D) Describe the target group of users of our solution? And how they will be benefited by our proposed solution to the problem?** Users:

1. Passengers:

   Bangladesh's railway system is one of the country's major mass transportation systems.

   Passengers on trains will benefit the most from ensuring a safe journey.

2. Train Dispatcher :

   A train dispatcher is employed by a railroad to direct and facilitate the movement of trains over an assigned territory, which is usually part, or all, of a railroad operating division. By using GPS tracking a train dispatcher can monitor every available train on that territory. By doing so, dispatching train will be lot easier. If they find any anomaly in the system, train dispatcher can solve that problem without any delay.

3. Station Master:

   The Station Master must daily inspect the station which must include the inspection of cabins, signals, level crossing gates, lamps, weighing machines, goods and station yard and vehicles standing therein, at least once a day. By using the system, the station master can check every crossing gate, lamps at once.

4. Section Controller:

   The tasks a Section Controller, Railway is expected to perform include: Controlling the movement of rail traffic within their section. Arranging the crossing of trains, efficient utilization of wagons and formation of goods trains at junction stations. By using the system section controller can easily monitor the traffic within their section. The system can detect if there's any problem with the fish plates available in the area.

5. Train Engineer

   Train engineers, also known as locomotive engineers, work onboard moving locomotives. They are responsible for operating trains, driving them safely between stations. Most train engineers start as brake operators, switch operators or conductors, and earn promotion through experience and training. A train engineer can monitor traffic using the system. He can also check the fish plates and crossing gates for any anomalies.

- **(E) Describe the contribution of our project to the development of scientific results that is identified and well documented.**

  The existing conventional signaling system most of the time relies on oral communication through telephonic and telegraphic conversations as input for the decision-making in track location for trains. There is large scope for miscommunication of the information or communication gap due to the higher human interference in the system. This miscommunication may lead to the wrong allocation of the track for trains, which ultimately leads to the train collision.IR sensors are used to identify the cracks in the railway. IR sensors have limitations due to the geographic nature of the tracks. The Anti-collision device system is found to be ineffective as it is not considering any active inputs from the existing Railway signaling system and lacks two ways communication capability between the trains and the control centers or stations. At present laser proximity detector is used for collision avoidance, IR sensors identify the cracks in the railway track, and gate control is done by a manual switch-controlled gate. But there is no

  combined solution for collision between trains, a train derailment in curves and bends, and the automatic system of railway gates.

  The proposed Train Anti Collision System consists of a self-acting anti-collision technique that works round-the-clock to avert train collisions and accidents at the level crosses. This enhances safety in train operations by providing a signal additional safety overlay. The system operates with strong signaling and nowhere affects the vital functioning of the present safety systems deployed for train operations. The efficiency of the system is expected to be considerably increased as the proposed system takes inputs from the GPS navigation and also from the level crossing gates. As more relevant data are included, it is expected that the present system may assist local drivers in averting accidents efficiently. As no change is necessary to be made to the infrastructure of the existing system, the cost of implementation of this system is also less

- **(F) Provide a description of all the existing studies presented in the problem area. What are the existing software solutions (for project) are available to solve the aforementioned problems?**

1. Unwanted congestion on railway tracks: Behavior of congestion on railways are analyzed and discussed. As well as in many other countries, Sweden faces increasing demand for transport. To meet this new demand, railways play an important role. Today, the capacity of the Swedish rail network is not upgraded at the speed necessary to keep up with the increase in traffic demand. The sensitivity of the railway system rises as the capacity utilization increases. At some point the marginal gain of operating one extra train is lower

   than the costs in term of increased sensitivity to delay, i.e., maximum capacity has been reached.

2. More than 1 train on a track: Train should run on different tracks on different time. If 2 train tries to run on a same track it'll be a disaster.

3. Removal of fish plates: For removal of fish plates so many disasters should be happened like delay of train schedule, Train accidents etc.

- **(G) What are the existing software solutions are available to solve the aforementioned problem? And how our proposed solution is going to extend them in providing more**

The existing software for this solution is available in a foreign country. It is called an infrared ACD. It works on gate approach, gate occupied, gate open, guard ACD, station ACD, level crossing gate ACD, etc. India's ifrared-based anti-collision system is called "Kavach. All of the existing projects in the world are based on radio technology, but none of them uses GPS & power relays to detect illegal fish plates removals. We are going to extend those systems with automatic braking systems and fish plate removal checks.

2. REQUIREMENTS:

1. Software Login

1.1 The software shall allow users to login with their given username and password.

1.2 The login credentials (username and password) will be verified with database records.

1.3 If the login successful the home page of the user account will be displayed.

1.4 If the username and/or password has been inserted wrong, the random verification code will be generated and sent to the user's email address by the system to retry login.

1.5 If the number of login attempt exceed its limit (3 times), the system shall block the user account login for one hour Priority Level: High

Precondition: user have valid user id and password

2. Automated Departure Signals

2.1 System will automatically send signals to corresponding gate master's.

2.2 System will measure arrival times to each cross gates and inform corresponding gate master

2.3 system will compute estimated time of arrival to stations of corresponding routes Priority Level: High

Precondition: An AI system must be on stations to capture train flow

3. **Route Check**

3.1 System will check the routes before departure.
3.2 If route check comes positive system shall allow train to dispatch
3.3 If route check comes negative system should stop departure and notify head office
3.4 Then administrator will then take the necessary steps. Priority Level: High

Precondition: An AI system must be there to check routes

4. **Route Map**

4.1 System should allow user and admins to see routes congestion map
4.2 System should allow users to select specific routes to see current conditions.
4.3 A sound wave of frequency 440 hz will be there on train if system detects congestion in route Priority Level: High

Precondition: Only authorized user can use the system

5. **Train flow control**

5.1 System shall control each train's speed
5.2 System shall control Congestion on routes
5.3 If a route is not safe system will change the path of course. Priority Level: High

Precondition: Al system must be there to control train flow.

6. **Show Time and Distance**

6.1 Time will be shown all the time.
6.2 Distance will be shown in the map with syncing with time and train's in tracks. Priority Level: High.

Precondition: Al system must be there to show trains on map

7. **Audit tracking:**

7.1 All risky routes will be recorded.
7.2 If User want, they can check their Financial Data.
7.3 User can print their financial data.

8. **Dashboard**

8.1 All feature of software will be shown in the Landing page.
8.2 The software will allow user to use each and every feature.
8.3 If user want, they can filter their dashboard.

8.4 User can use find any Data source easily from it.

9. Authorization Levels

9.1 Authority must assign a user to the system.
9.2 User must have his/her information's on the system.
9.3 The server allows or disallows particular actions based on permissions assigned too authentic user.
9.4 User can change their information if there is any update.

10. Legal and Regularity

10.1 The system will allow user to see their every step stored in data.
10.2 The software system should be integrated with banking and mobile banking.

11. Security

11.1 The specific speed of trains will be set by the system 12.2 The software will be notified if any 2 trains in one route.
12.3 User will be able to send braking signal through the app

12. Scalability

12.1 The Landing page supports 1000 users and will maintain optimize performance
12.2 User can reload the system Priority Level: High
Precondition: Only specified User can access the system

13. Portability

13.1 A valid user will be Launch the application from any environment without changing its behavior
13.2 A valid user can enable system in two way, Horizontal and vertical Priority Level: High
Precondition: User can access the system in every environment

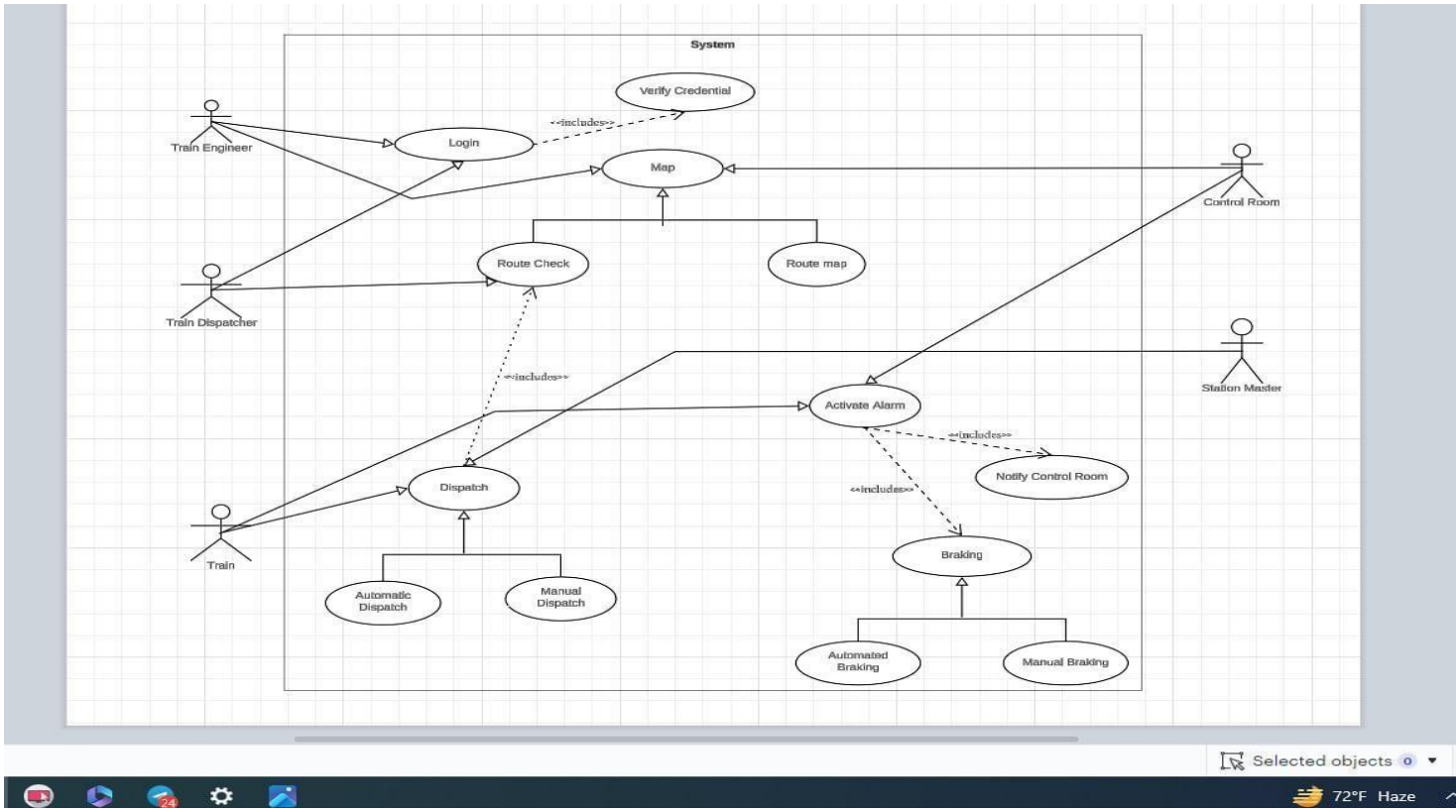
14. Reliability

14.1 A valid user can fully rely on the Ai system implemented in software
14.2 If User face any problem, they must report it
User will Login and Go to Feedback page

Priority Level: High
Precondition: Ensure user failure free operation.

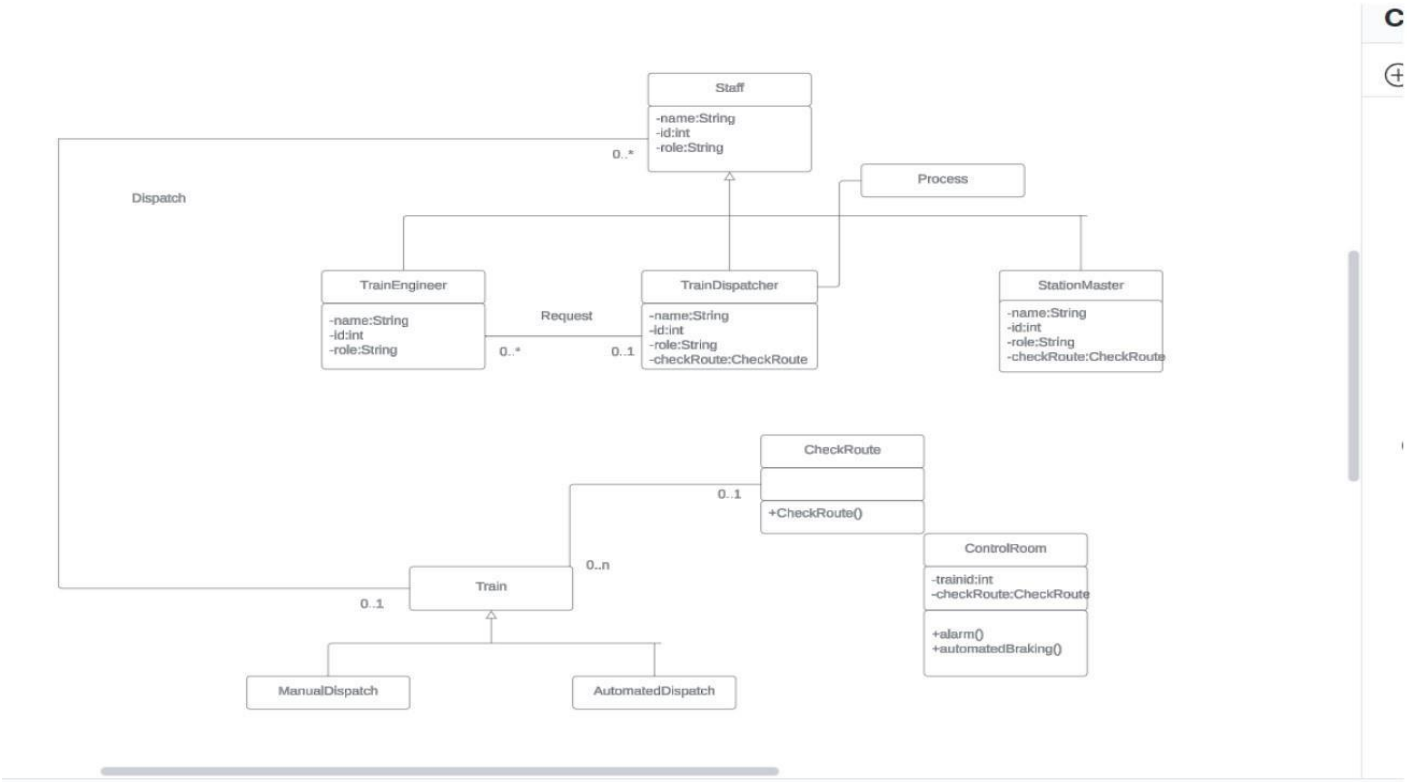
3. USE CASE DIAGRAM:

Link: https://lucid.app/lucidchart/94d24266-395d-4c06-b03f-cf38c8365735/edit?view_items=_BMesjZ~3NBU&invitationId=inv_ff8f9eb8-35b44e06-a2b1-54217af2eec8



4. CLASS DIAGRAM:

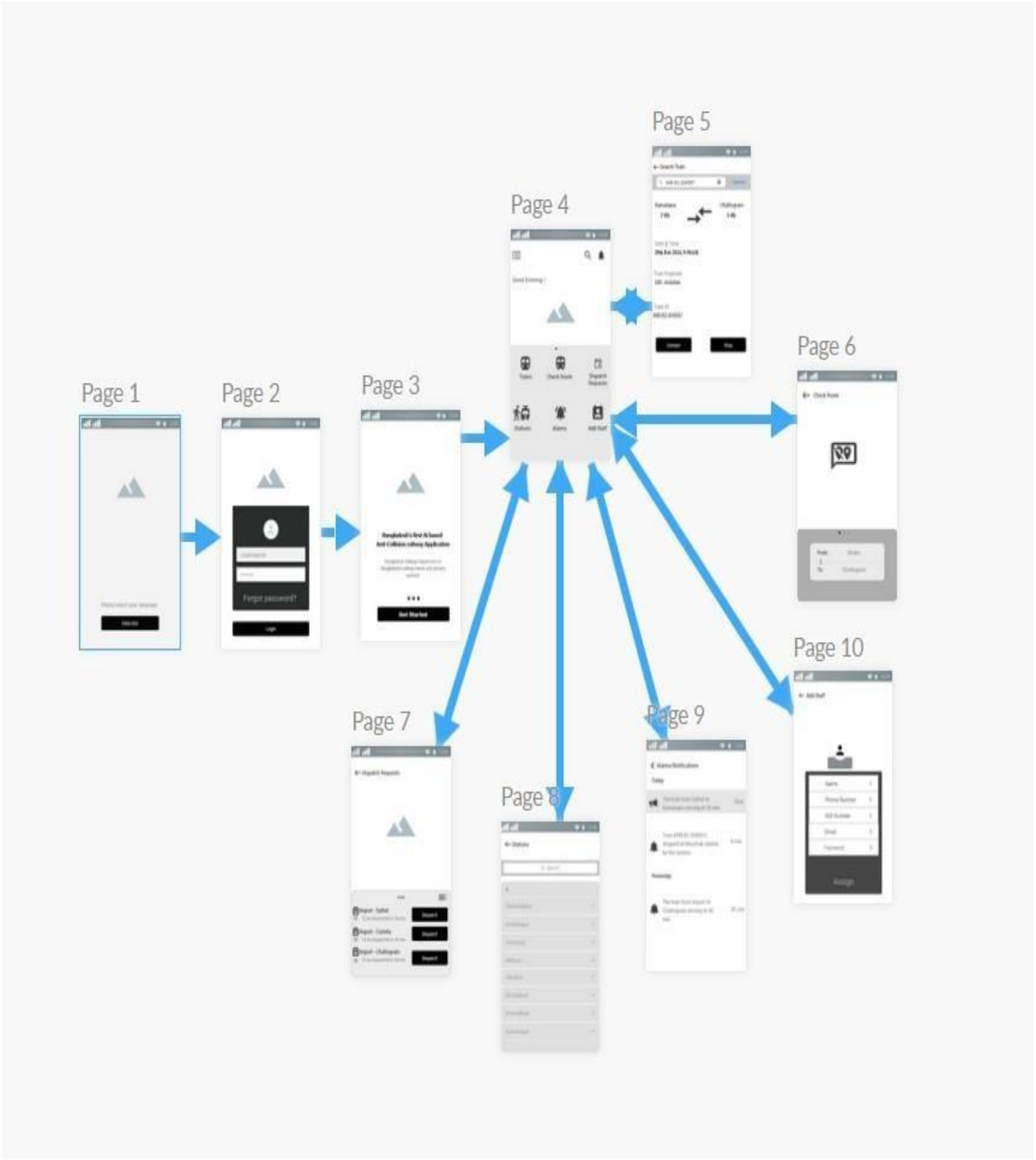
Link: https://lucid.app/lucidchart/2b427324-dd5a-4a5f-a7c2b300a2499495/edit?viewport_loc=-370%2C155%2C2913%2C1268%2C0_0&invitationId=inv_abc2c529-5d9e-4b20-933d84427234a6f9



5. Prototype UX Design:

Link:

https://www.fluidui.com/editor/live/preview/cF81bU10WE5wYmJuZXBOeVBnYTNxbFg4REtmMBsc2xieg==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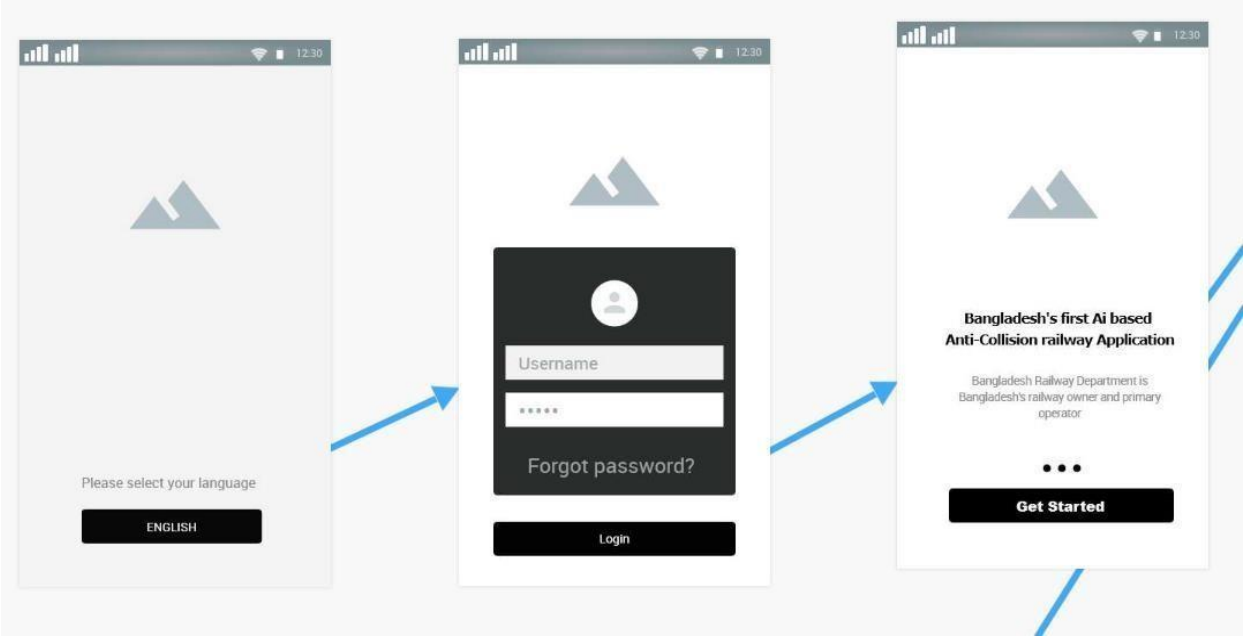
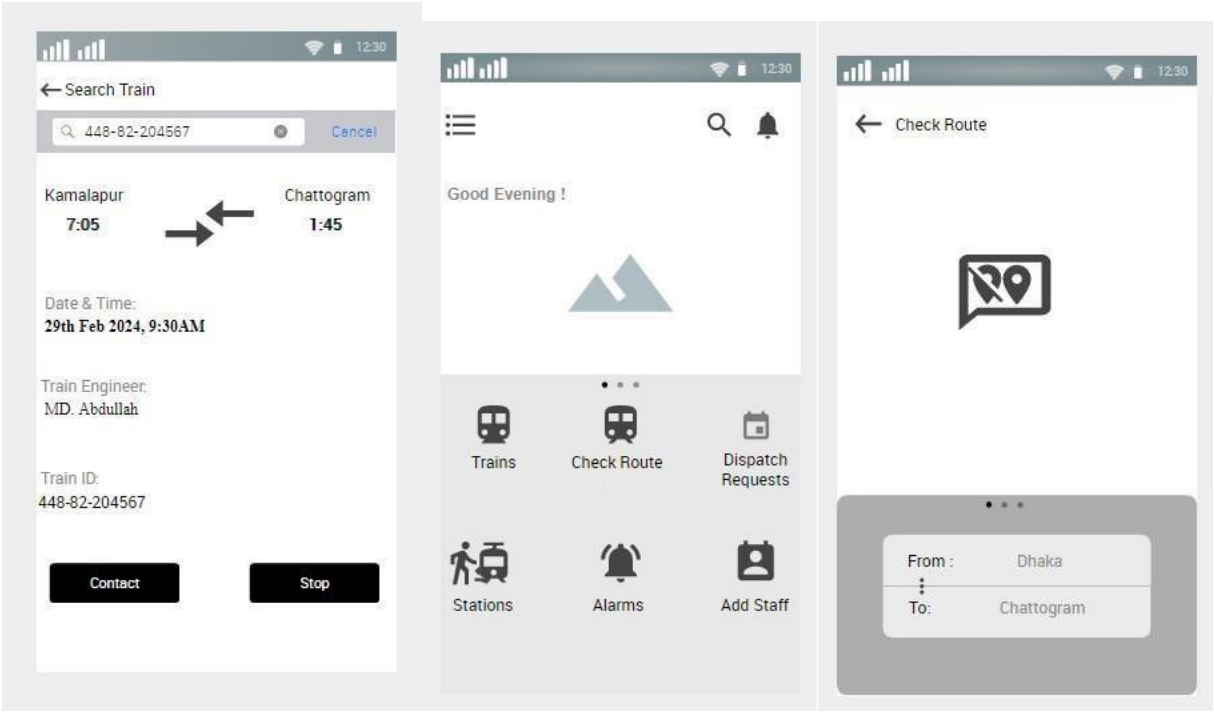
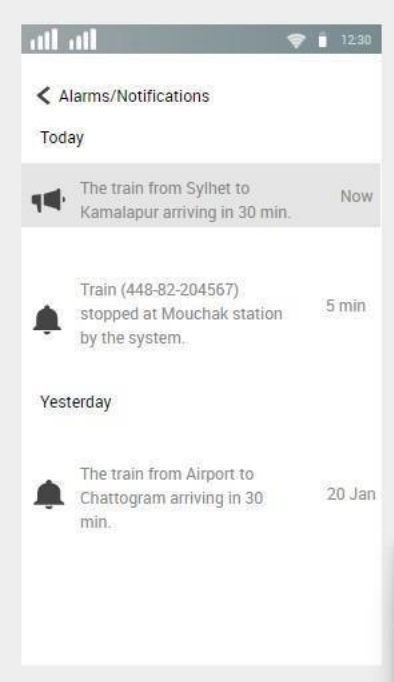
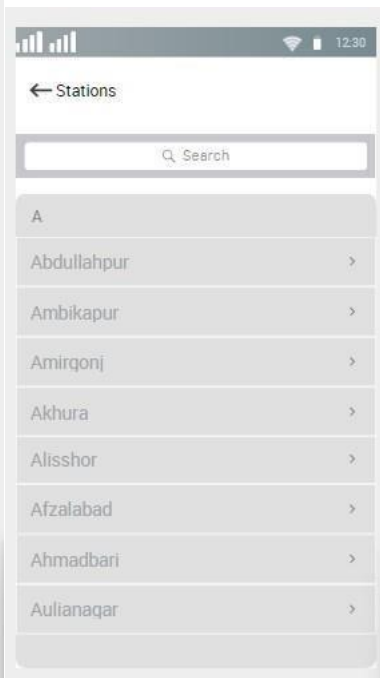
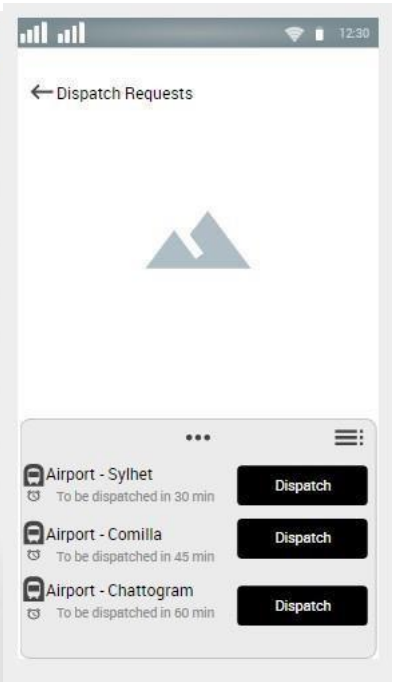
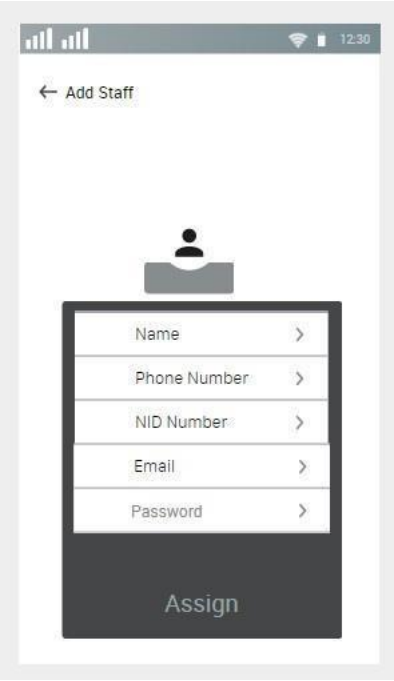

Please select your language
ENGLISH
Username
Forgot password?
Login
Bangladesh's first Ai based Anti-Collision railway Application
Bangladesh Railway Department is Bangladesh's railway owner and primary operator
Get Started


Search Train
448-82-204567
Cancel
Kamalapur
7:05
Chattogram
1:45
Date & Time:
29th Feb 2024, 9:30AM
Train Engineer:
MD. Abdullah
Train ID:
448-82-204567
Contact
Stop
Good Evening !
Trains
Check Route
Dispatch Requests
Stations
Alarms
Add Staff
Check Route
From :
Dhaka
To:
Chattogram


12:30
Alarms/Notifications
Today
The train from Sylhet to Kamalapur arriving in 30 min.
Now
Train (448-82-204567) stopped at Mouchak station by the system.
5 min
Yesterday
The train from Airport to Chattogram arriving in 30 min.
20 Jan


12:30
Stations
Search
A
Abdullahpur
Ambikapur
Amirgonj
Akhura
Alisshor
Afzalabad
Ahmadbari
Aulianagar


12:30
Dispatch Requests
Airport - Sylhet
To be dispatched in 30 min
Dispatch
Airport - Comilla
To be dispatched in 45 min
Dispatch
Airport - Chattogram
To be dispatched in 60 min
Dispatch


12:30
Add Staff
Name
Phone Number
NID Number
Email
Password
Assign

6. PROJECT TEST

Test Case 1.1:

Project Name: Railway Anti-Collision System In Bangladesh			Test Designed by: MD Ifthakhar Mahmud	
Test Case ID: RAC_1			Test Designed date: 01/05/2024	
Test Priority (Low, Medium, High): Medium			Test Executed by: MD Ifthakhar Mahmud	
Module Name: Login Session			Test Execution date: 01/05/2024	
Test Title: verify login with valid username and password				
Description: Test website login page				
Precondition (If any): User must have valid username and password				
Test Steps	Test Data	Expected Results	Actual Result	Status(pass/fail)
1. Go to the website 2. Enter username 3. Enter password 4. Click submit	Username: Ifthakhar24 Password: pass13564	User should login into the application	As expected,	Pass
Post Condition: User is validated with database and successfully login to account. The account session details are logged in the database.				

Test Case 1.2:

Project Name: Railway Anti-Collision System In Bangladesh	Test Designed by: MD Ifthakhar Mahmud
Test Case ID: RAC_1.2	Test Designed date: 01/05/2024
Test Priority (Low, Medium, High): Medium	Test Executed by: MD Ifthakhar Mahmud
Module Name: Login Session	Test Execution date: 01/05/2024
Test Title: verify login with valid username and password	
Description: Test website login page	
Precondition (If any): User must have valid username and password	

Test Steps	Test Data	Expected Results	Actual Result	Status(pass/fail)
1. Go to the website 2. Enter username 3. Enter password 4. Click submit	Username: omar24 Password: pass135653	User shouldn't login into the application with incorrect password	As expected,	Pass

Post Condition: User is validated with database and successfully login to account. The account session details are logged in the database.

Test Case 2.1:

Project Name: Railway Anti-Collision System In Bangladesh	Test Designed by: ANIK, ZAHID HASAN TALUKDER
Test Case ID: RAC_2.1	Test Designed date: 01/05/2024
Test Priority (Low, Medium, High): High	Test Executed by: ANIK, ZAHID HASAN TALUKDER
Module Name: Automated Departure Signals	Test Execution date: 01/05/2024
Test Title: Automated Signals Testing	
Description: Check dispatch signals	
Precondition (If any): Must have login into application An AI system must be on stations to capture train flow.	

Test Steps	Test Data	Expected Results	Actual Result	Status(pass/fail)
1. Click on notification icon		User can check dispatch signal for each train on the specified station.	As expected	pass

Post Condition: User is validated with database and successfully login to account. The account session details are logged in the database.

Test Case 2.2:

Project Name: Railway Anti-Collision System In Bangladesh	Test Designed by: ANIK, ZAHID HASAN TALUKDER
Test Case ID: RAC_2.2	Test Designed date: 01/05/2024
Test Priority (Low, Medium, High): High	Test Executed by: ANIK, ZAHID HASAN TALUKDER
Module Name: Automated Departure Signals	Test Execution date: 01/05/2024
Test Title: Automated Signals Testing	
Description: Check Arrival time for cross gates	
Precondition (If any): Must have login into application An AI system must be on stations to capture train flow.	

Test Steps	Test Data	Expected Results	Actual Result	Status(pass/fail)
1. Click on notification icon		User can check estimated arrival time for each cross gate on the specified station area.	As expected	pass

Post Condition: User is validated with database and successfully login to account. The account session details are logged in the database.

Test Case 3:

Project Name: Railway Anti-Collision System			Test Designed by: SHARMIN JAHAN	
Test Case ID: RAC.3			Test Designed date: 01/05/2024	
Test Priority (Low, Medium, High): High			Test Executed by: SHARMIN JAHAN	
Module Name: Route Check			Test Execution date: 01/05/2024	
Test Title: Verify the routes works or not				
Description: Test route check				
Precondition (If any): Null				
Test Steps	Test Data	Expected Results	Actual Result	Status(pass/fail)
2. Login to the system 3. Open dashboard 4. Click on check routes	From: Dhaka To: Joypurhat	User Should See the route selection page	User should see the route	Pass
Post Condition:				

Test Case 4:

Project Name: Railway Anti-Collision System In Bangladesh	Test Designed by: SHARMIN JAHAN
Test Case ID: RAC_1	Test Designed date: 01/05/2024
Test Priority (Low, Medium, High): Medium	Test Executed by: SHARMIN JAHAN
Module Name: Route Map	Test Execution date: 01/05/2024
Test Title: Verify that users can see route map	
Description: Test route map	
Precondition (If any): User must be a valid user	

Test Steps	Test Data	Expected Results	Actual Result	Status(pass/fail)
1. Go Application 2. Enter username 3. Enter password 4. Click submit 5. Click Check Route		User should see route map under check route option	As expected,	Pass

Post Condition: The account session details are logged in the database.

Test Case 5:

Project Name: Railway Anti-Collision System In Bangladesh			Test Designed by: MD IFTHAKHAR MAHMUD	
Test Case ID: RAC_5			Test Designed date: 01/05/2024	
Test Priority (Low, Medium, High): High			Test Executed by: MD IFTHAKHAR MAHMUD	
Module Name: Train flow control			Test Execution date: 01/05/2024	
Test Title: Control train flow				
Description: Check the train flow and control when needed				
Precondition: AI system must active to check the train flow				
Test Steps	Test Data	Expected Results	Actual Result	Status(pass/fail)
1. Login into the sytem 2. Open dashboard 3. Click trains		User should see the train flow	Train flow showed	pass
Post Condition:				

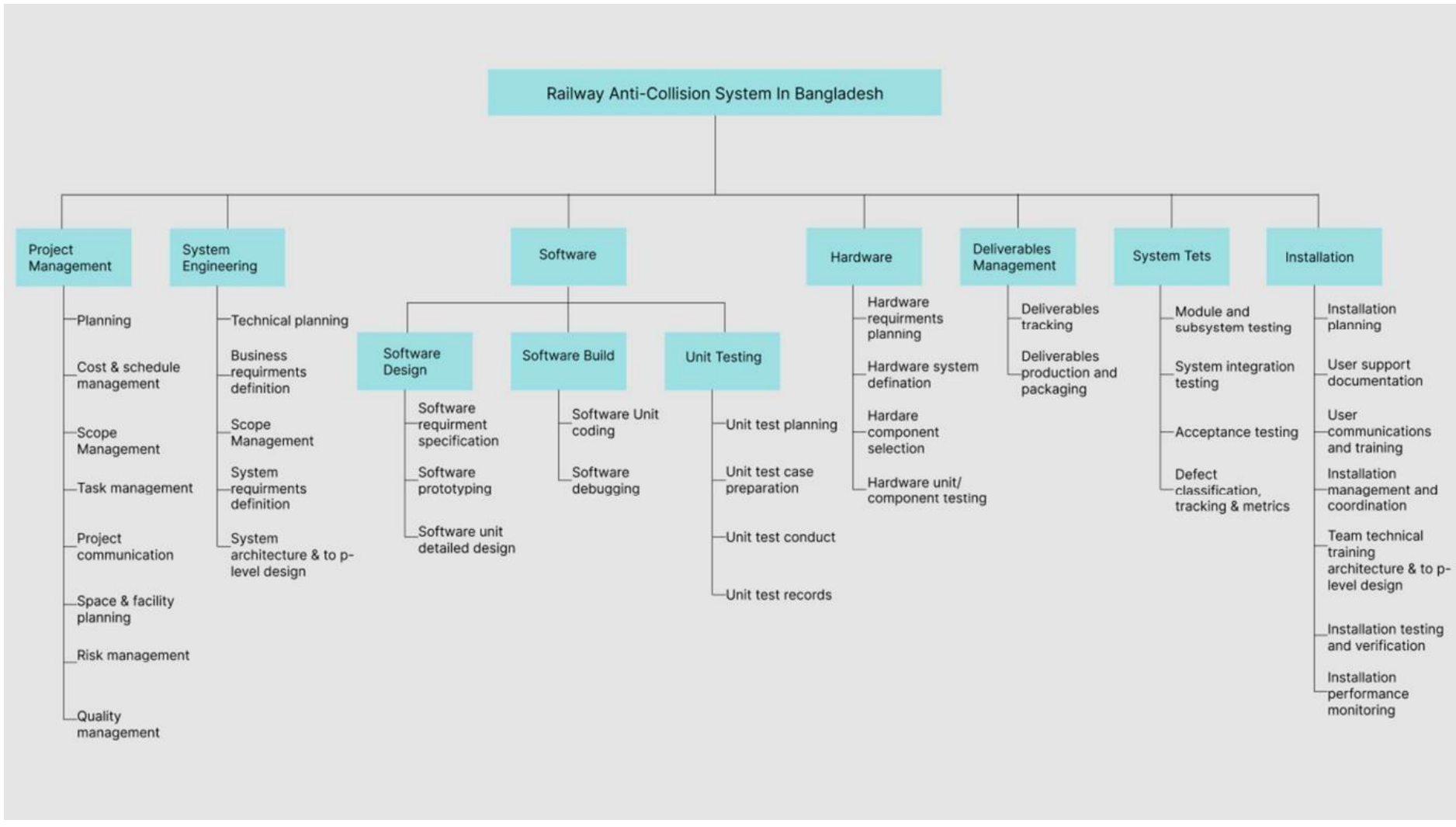
Test Case 6:

Project Name: Railway Anti-Collision System In Bangladesh		Test Designed by: ANIK, ZAHID HASAN TALUKDER
Test Case ID: RAC_7		Test Designed date: 01/05/2024
Test Priority (Low, Medium, High): High		Test Executed by: ANIK, ZAHID HASAN TALUKDER
Module Name: Show Time and Distance		Test Execution date: 01/05/2024
Test Title: Time and distance		
Description: Check time and distance and check the collision		
Precondition:		

Test Steps	Test Data	Expected Results	Actual Result	Status(pass/fail)
1.Login into the sytem 2.Open dashboard 3.Click dispatch request		User should see the time and distance	Train flow showed	pass

Post Condition:

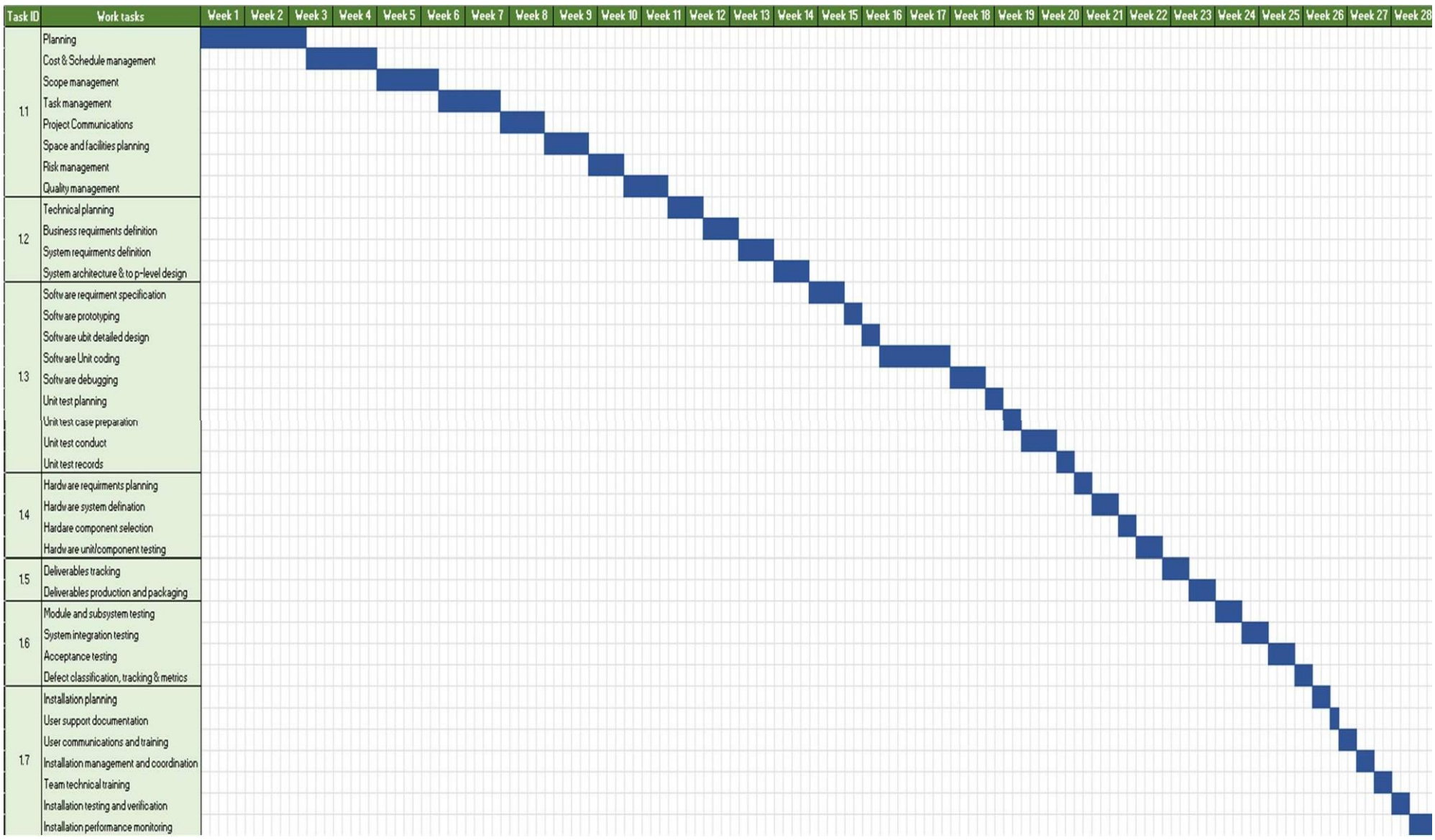
7: WORK BREAKDOWN STRUCTURE:



8: Gantt Chart:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
A: Andy																												
B: Andy																												
C: Andy																												
D: Andy																												
E: Dave																												
F: Sam																												
G: Sam																												
H: Sam																												

A: Requirements Gathering	E: Code
B: Planning	F: Test
C: Analysis	G: Delivery
D: Design	H: Support



9. RISK MANAGEMENT :

Risks	Category	Probability	Impact
Size estimate may be significantly low	PS	60%	2
Larger number of users than planned	PS	70%	3
Legal risk may arise from legal and regulatory authorities	BU	20%	2
End-users resist system	BU	40%	3
Market risk due to competition	BU	60%	1
Funding will be lost	CU	40%	1
Customer will change requirement	PS	80%	2
Technology will not meet expectations	TE	30%	1
Project purpose and need is not well defined	BU	30%	1
Management and financial authority structure are not yet well defined	BU	60%	2
Overall project schedule delay	PS	60%	2
Staff inexperienced	ST	60%	2