Software Engineering

Practical file

BACHELOR OF COMPUTER APPLICATION (BCA)

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Sri Guru Tegh Bahadur Institute of Management & Information Technology

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Q1 Select and write the problem statement for a real time system of relevance.

Problem Statement: Railway Reservation System

The current rail management system faces several challenges that hinder its efficiency and effectiveness. These challenges include:

1. Inefficient Operations: The existing rail management system lacks real-time monitoring and coordination capabilities, resulting in delays, congestion, and inefficient train operations. This leads to reduced customer satisfaction and increased operational costs.
2. Lack of Predictive Maintenance: The current system relies on manual inspections and scheduled maintenance, which can be both time-consuming and costly. This reactive approach often results in unexpected breakdowns and service disruptions. There is a need for a predictive maintenance system that can detect potential issues in advance and schedule maintenance activities accordingly.
3. Inadequate Passenger Information: Passengers often face difficulties in obtaining accurate and timely information about train schedules, delays, cancellations, and alternative routes. This lack of information leads to confusion, inconvenience, and dissatisfaction among passengers.
4. Limited Capacity Management: The current rail management system struggles to effectively manage increasing passenger demands and optimize capacity utilization. This often leads to overcrowded trains, particularly during peak hours, and can compromise passenger safety and comfort.
5. Insufficient Security Measures: With the rise in security threats, the existing rail management system may not have robust security measures in place. This can pose risks to the safety of passengers, train personnel, and rail infrastructure. There is a need for enhanced security measures, including surveillance systems and emergency response protocols.
6. Integration Challenges: The existing rail management system may operate in silos, with limited integration between different departments and systems. This lack of integration can result in inefficiencies, data inconsistencies, and difficulties in decision-making.

To address these challenges, a new rail management system is required that integrates advanced technologies such as real-time monitoring, predictive analytics, and automated decision-making. The system should prioritize efficient operations, proactive maintenance, accurate passenger information, optimal capacity management, robust security measures, and seamless integration

between various components. By addressing these issues, the new rail management system aims to improve overall service quality, reliability, safety, and customer satisfaction in the rail transportation industry.

Rail Management System should have the following features.

Features of Rail Management System:

1. Real-time Train Monitoring: The system provides real-time monitoring of trains, allowing rail operators to track the location, speed, and status of each train. This helps in better operational planning, schedule adherence, and proactive management of delays or disruptions.

2. Predictive Maintenance: The system incorporates predictive maintenance algorithms that use data from various sensors and historical maintenance records to identify potential equipment failures or maintenance needs. This enables proactive

3. maintenance scheduling, reduces downtime, and improves overall reliability.

4. Passenger Information System: The system includes a comprehensive passenger information system that provides accurate and up-to-date information about train schedules, delays, cancellations, platform information, and alternative routes. This can be delivered through digital displays, mobile applications, and public address systems, ensuring passengers are well-informed.

5. Capacity Management and Optimization: The system employs advanced analytics and modeling techniques to optimize capacity utilization and manage passenger flow efficiently. It can provide insights on demand patterns, peak hours, and overcrowding risks, enabling better resource allocation and improved passenger experience.

6. Enhanced Security Measures: The rail management system incorporates robust security measures such as surveillance cameras, access control systems, and emergency response protocols. It helps in deterring and responding to security threats, ensuring the safety of passengers, staff, and infrastructure.

7. Integration with External Systems: The system facilitates seamless integration with external systems, such as ticketing systems, maintenance management systems, and emergency services. This enables efficient data exchange, streamlined operations, and improved decision-making across different departments.

8. Analytics and Reporting: The system includes comprehensive analytics and reporting capabilities to generate insights and performance indicators. It can provide data on train punctuality, maintenance costs, passenger satisfaction, and other key performance metrics. These reports help in monitoring system performance, identifying areas for improvement, and making data-driven decisions.
9. Centralized Control and Command Center: The rail management system incorporates a centralized control and command center where operators can monitor and manage the entire rail network. It provides a unified view of train operations, maintenance activities, security incidents, and passenger information, enabling effective coordination and quick response to any issues.

10. Mobile Accessibility: The system offers mobile accessibility for rail staff, allowing them to access real-time information, receive alerts, and perform necessary tasks from their mobile devices. This improves communication, operational efficiency, and enables prompt action during emergencies or disruptions.

11. Customer Feedback and Complaint Management: The system includes mechanisms to collect customer feedback, handle complaints, and track their resolution. This helps in improving customer satisfaction, addressing issues promptly, and continuously enhancing the quality of rail services.

These features collectively enhance the efficiency, reliability, safety, and customer experience of the rail management system, contributing to a well-organized and modernized rail transportation network.

Q2: Analyze requirement for a system and develop Software Requirement Specification Sheet (SRS) for suggested system.

SRS on 'Rail Management System'

Software Requirements Specification (SRS) for Rail Management System

1. Introduction 1.1 Purpose The purpose of this document is to define the software requirements for the Rail Management System. It outlines the functionality, constraints, and performance requirements of the system.

1.2 Scope The Rail Management System aims to improve the efficiency, reliability, and safety of rail transportation. It includes features such as real-time train monitoring, predictive maintenance, passenger information system, capacity management, security measures, integration with external systems, analytics, and reporting.

2. Overall Description 2.1 Product Perspective The Rail Management System will be a standalone software application that interfaces with various subsystems, including train monitoring, maintenance, passenger information, security, and external systems. It will provide a centralized control and command center for efficient management of the rail network.

2.2 User Classes and Characteristics The system will cater to different user classes, including rail operators, maintenance personnel, station staff, and passengers. Users will have varying levels of technical expertise, and the system should be user-friendly and intuitive.

2.3 Operating Environment The Rail Management System will operate in a networked environment, utilizing servers, databases, communication networks, and various hardware and software components. It should be compatible with commonly used operating systems and support mobile accessibility.

3. System Features and Requirements 3.1 Real-time Train Monitoring

- The system should track and display real-time train locations, speeds, and statuses.
- It should provide alerts and notifications for delays, disruptions, and incidents.
- The system should support visual representation of trains on a map for easy monitoring.

3.2 Predictive Maintenance

- The system should use historical data and sensor inputs to predict potential equipment failures.
- It should schedule maintenance activities proactively to minimize downtime and optimize maintenance costs.

- The system should generate alerts for maintenance personnel based on predefined thresholds.

3.3 Passenger Information System

- The system should provide accurate and up-to-date information on train schedules, delays, cancellations, and platform details.
- It should deliver information through digital displays, mobile applications, and public address systems.
- The system should support multilingual information dissemination.

3.4 Capacity Management and Optimization

- The system should analyze demand patterns and passenger flow to optimize capacity utilization.
- It should provide insights on peak hours, overcrowding risks, and recommend resource allocation strategies.
- The system should assist in managing reservations, seat availability, and crowd control measures.

3.5 Enhanced Security Measures

- The system should integrate surveillance cameras, access control systems, and emergency response protocols.
- It should provide real-time monitoring of security incidents and generate alerts for immediate action.
- The system should support incident reporting, investigation, and documentation.

3.6 Integration with External Systems

- The system should integrate with ticketing systems, maintenance management systems, and emergency services.
- It should facilitate seamless data exchange and synchronization between different subsystems.
- The system should provide APIs and interfaces for third-party integrations.

3.7 Analytics and Reporting

- The system should generate reports and analytics on train punctuality, maintenance costs, passenger satisfaction, and other performance metrics.
- It should provide dashboards and visualizations for monitoring system performance and trends.
- The system should support customizable reports and data export functionality.

3.8 Mobile Accessibility

- The system should have a mobile application or responsive design for easy access from mobile devices.
- It should provide real-time information, alerts, and notifications to rail staff on the go.

- The system should support offline functionality for critical operations during connectivity issues.

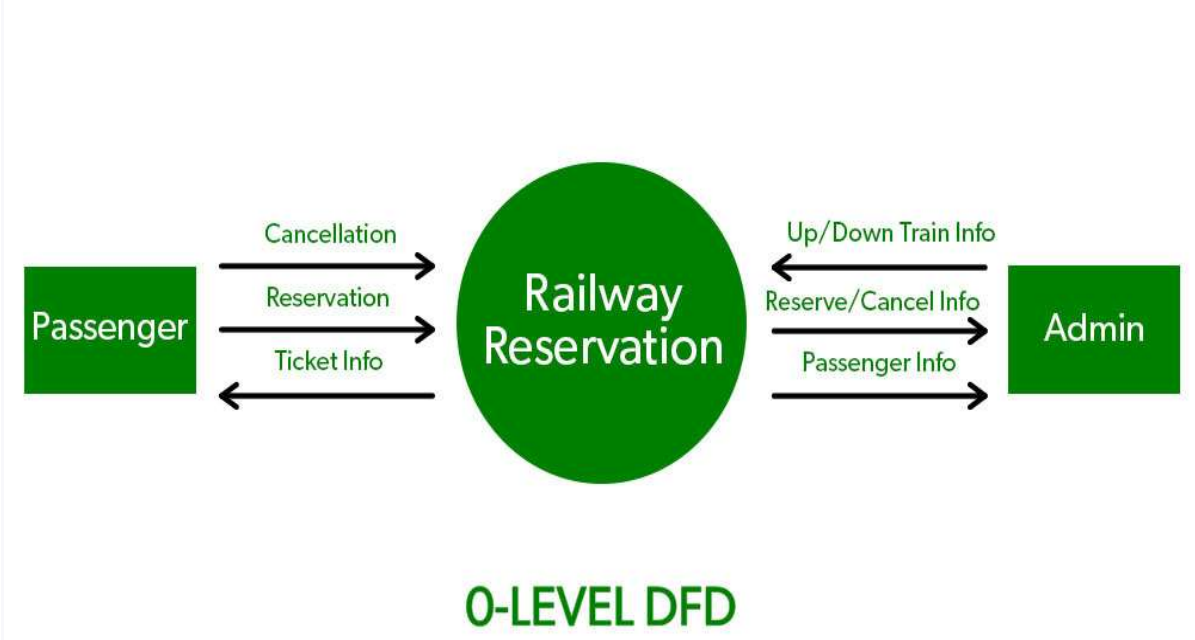
3.9 Customer Feedback and Complaint Management

- The system should enable passengers to provide feedback and lodge complaints through various channels.
- It should track complaints, assign them to relevant personnel, and monitor their resolution.
- The system should

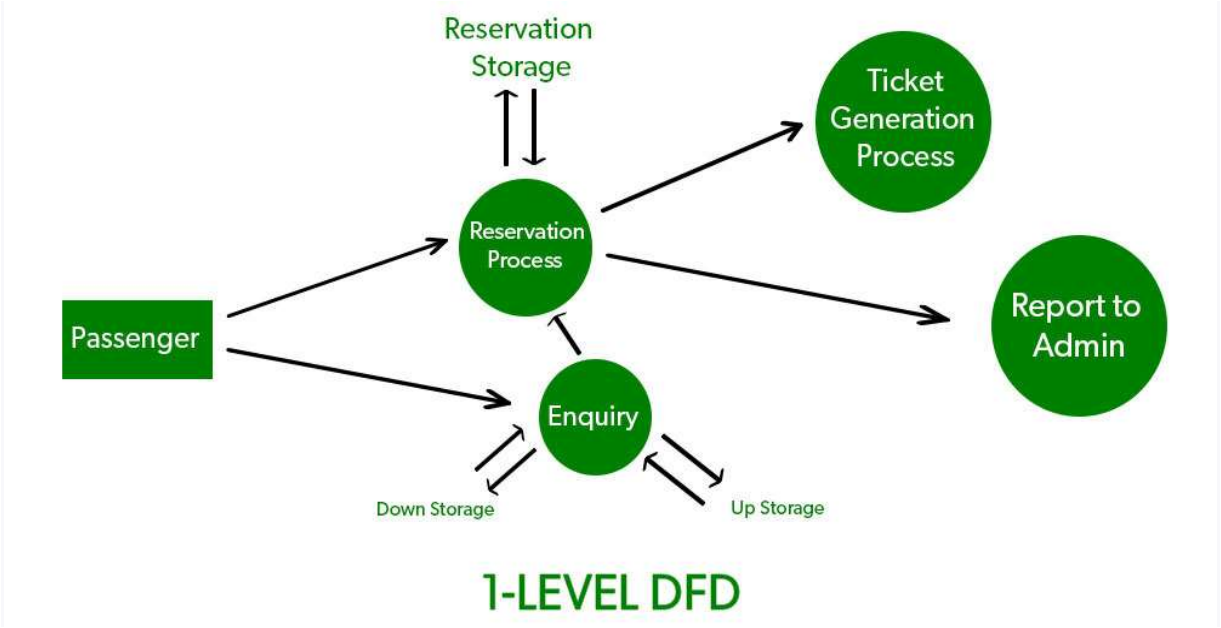
Q3: To create the function oriented diagram: Data Flow Diagram (DFD).

0 level DFD:-

DFD Level 0 shows the entities that interact with the system. It defines the border between the system and its environment. This context diagram depicts Rail Management Project at a high level.

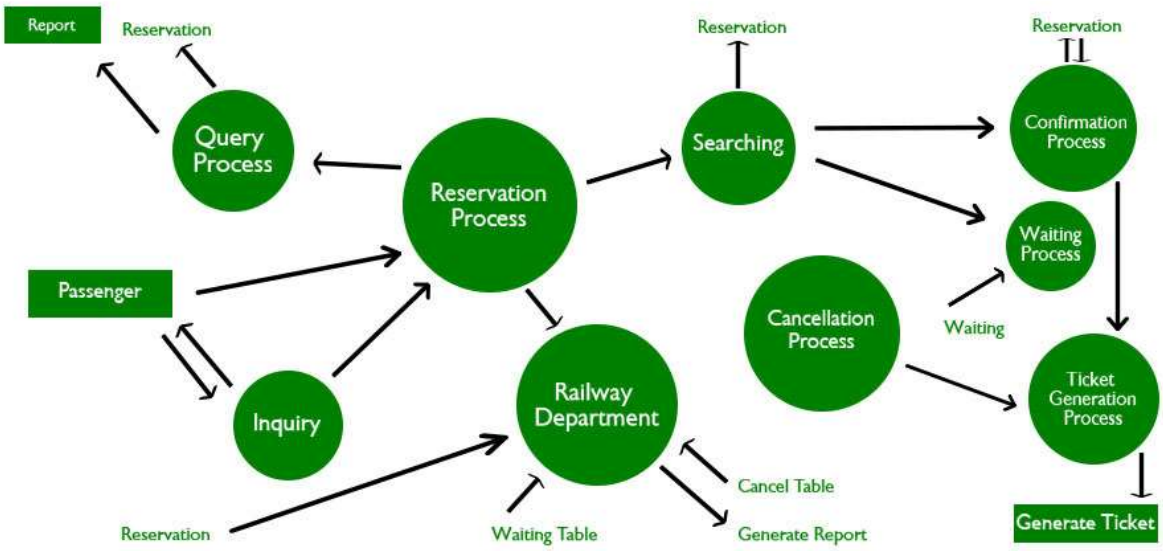


1-level DFD: In 1-level DFD, the context diagram is decomposed into multiple bubbles/processes. In this level, we highlight the main functions of the system and reakdown the high-level process of 0-level DFD into subprocesses.



1-LEVEL DFD

- **2-level DFD:** 2-level DFD goes one step deeper into parts of 1-level DFD. It can be used to plan or record the specific/necessary detail about the system's functioning.

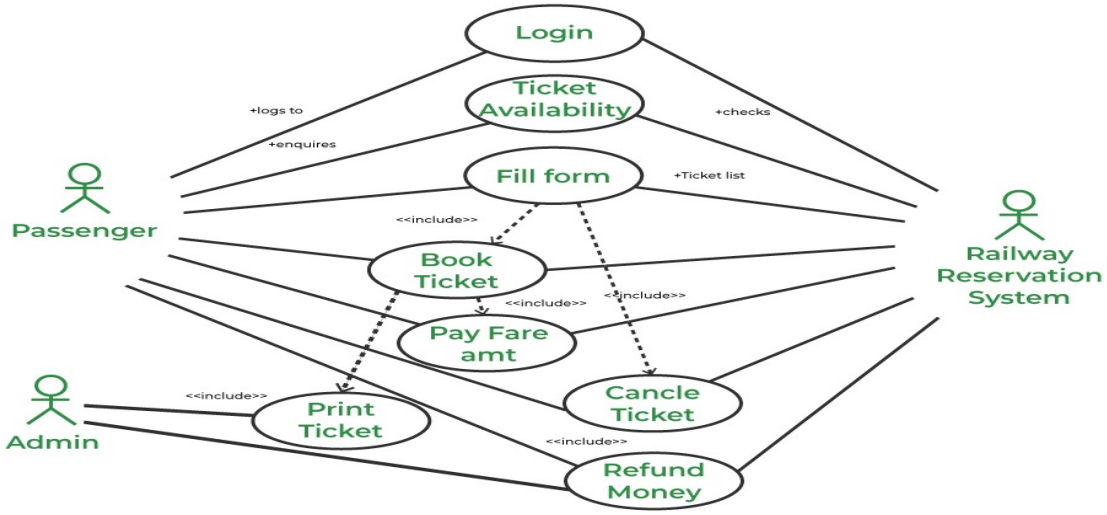


2-LEVEL DFD

Q4: To perform the user's view analysis for the suggested system: Use Case Diag.

Use-Case Diagram:

By using use case diagrams, the interactions between a system and the users within that system will be represented.



Use-Case Descriptions:

The relationship between the actors and the use cases of the online Railway reservation system is given below–>

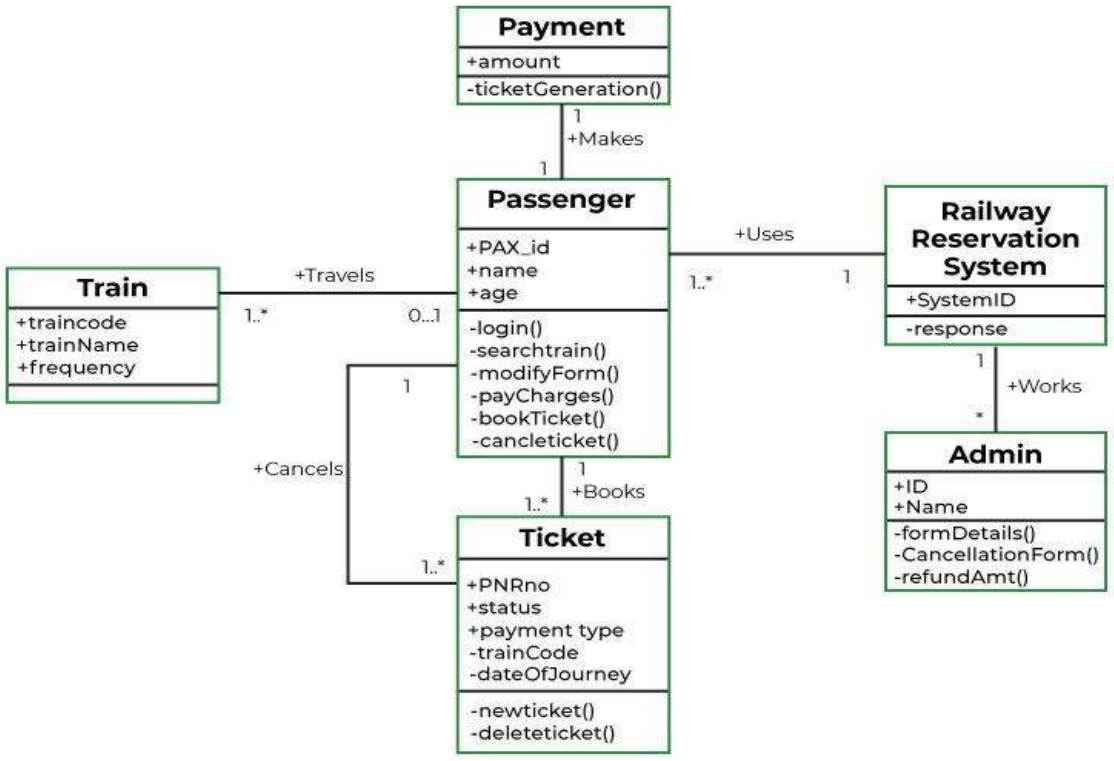
1. **Passenger Entity:** Use cases of passengers are login, ticket availability, Filling the form, Book ticket, Canceling ticket, and Refund money.
2. **Railway Reservation System:** Use cases of the Railway Reservation System are login, ticket availability, Fill the form, Book ticket, Cancel ticket, and Refunding money.
3. **Admin:** use cases of Admin are Print ticket, refund money. Admin also controls the whole Railway Reservation System in different cases.

Q5: To draw the structural view diagram for the system: Use Class Diagram.

Class Diagram:-

These diagrams describe the operation and attributes of a class with imposed constraints in the system. In this article the classes to be considered are ‘payment’, ‘train’, ‘passenger’, ‘ticket’, ‘railway reservation system’, ‘admin’. The description of the classes is given below.

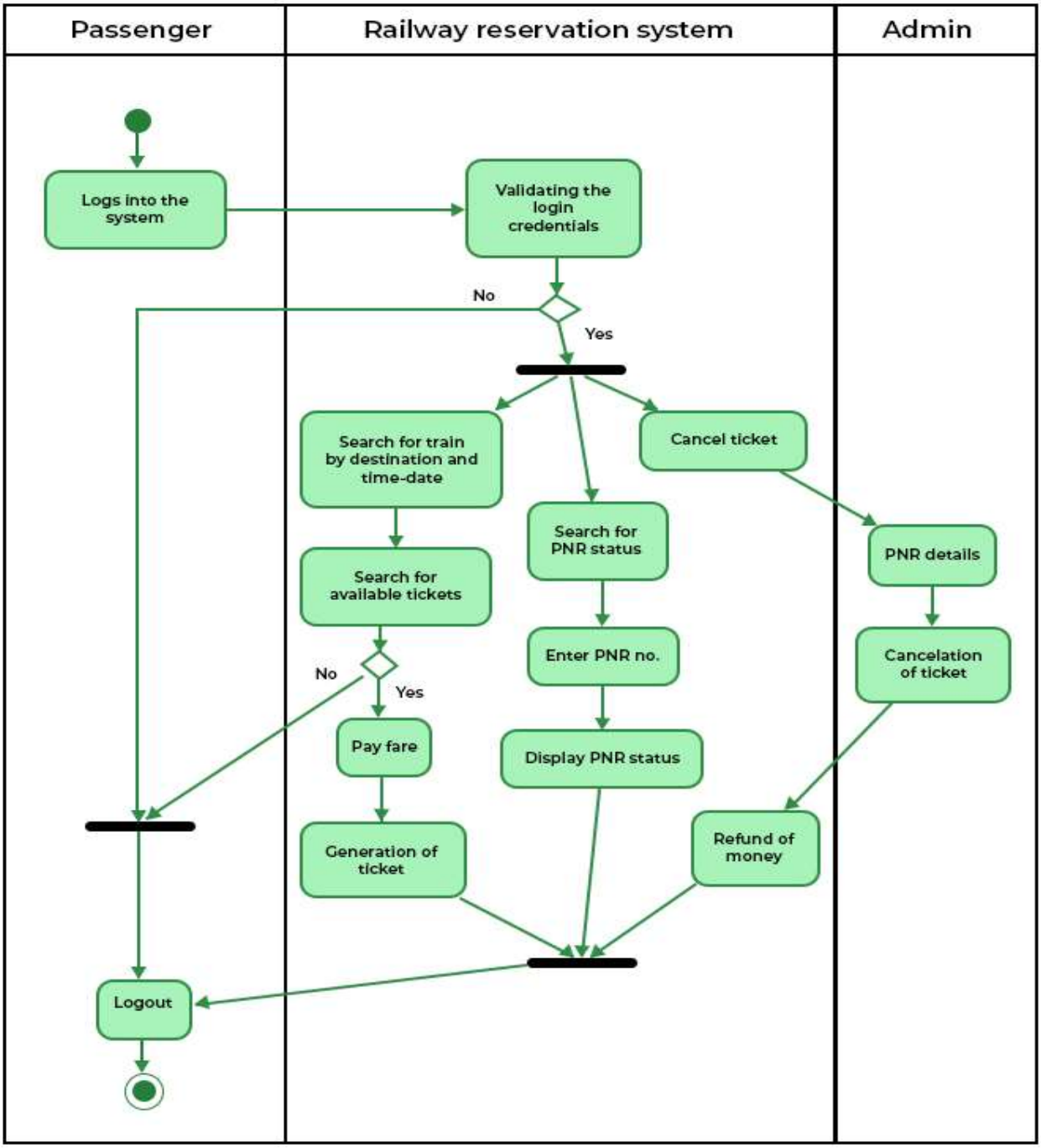
Class	Attributes	Processes
Payment	amount	ticketGeneration
Train	train code, train name, frequency	—
passenger	PAX_id, name,age,sex	login, search Train, modify the form, pay charges, book tickets now ticket, cancel tickets
ticket	PNR_no, status, payment type, train code search train, date of journey	new Ticket, delete tickets
railway reservation system	system	response
Admin	ID, name	formDetails, cancellationForm, refundAmt



Q6: To draw the behavioral view diagram : Use Activity Diagram

Activity Diagram:

This diagram shows the flow of processes from one to another activity.



Q7: To perform the behavioral view diagram for the suggested system : Use Sequence Diagram.

Sequence Diagram:

This diagram shows how and in which order a group of objects works together in a system. This is an interactive diagram and this is mostly used by software developers.