**Data Structures and Algorithms [23ECSC205]**

**Course Project – Phase I**

**Functionality Identification**

The following are the 4 Main categories listed

* Information and Communication
* Infrastructure and Facilities
* Passenger comfort and Amenities
* Sustainability and Green Initiatives

Sumedh S K

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| **Information and Communication** | | | |
| **Sl no** | **Function** | **Description** | **Tools** |
| 1 | Recommendation Engine | An application to recommend to the passengers, optimal hotels, restaurants etc. | Hash map |
| 2 | Streamlining Booking and Boarding Process | Making it easier and more convenient for the prospective passenger to acquire train tickets. | Queue |
| 3 | Crowd Management | Using CCTV cameras to monitor crowd movements and do crowd management | Arrays |
| 4 | LED Screening of Easily Accessible Info | Making it easier for passengers to get relevent information about things such as next incoming train times, platform numbers etc. | Linked List |
| 5 | Information Fetching | Fetching data sets from various sources | Hash map/Dictionary |
| 6 | Comfortable Seats | Providing better seating for the passengers | Arrays |
| 7 | Personalized Recommendations | Recommendation engine's functionality to provide recommendations relevant to the user | Arrays, Hash Maps |
| 8 | Proper Windows Placement | Optimal placement of windows within a train compartment | Linked List |
| 9 | Upcoming Stations Information | Providing the passengers, information about next stations | Linked List |
| 10 | Real-Time Monitoring | Real-Time Monitoring of passengers to provide additional functionality for the application | Graphs, Trees |

Om Muddapur

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| Problem Statement: Infrastructure and Facilities | | | |
| S.Num | Functionality | Description | Tools |
| 1 | Efficient Announcement Speaker | Announcing information to passengers about train timings at different platforms. | Arrays, Queues |
| 2 | Communications Between stations | Stations communication to provide information about train’s departing time, etc. | Linked list |
| 3 | Information Organization | Organization of required information to represent it to the suitable users. | Trees , Structure |
| 4 | Multilingual Features | Information at stations should be in English, national language, home language. | Trees |
| 5 | Entertainment Facilities | As journeys will be long some entertainments like T.V., etc can be installed in trains. | Queues |
| 6 | Proper lighting facilities in train | Bulbs that consume less power and also give illuminations should be installed. | Linked Lists |
| 7 | Displaying city maps | City maps at stations help people to navigate their desired location easily. | Graphs |
| 8 | Parking space efficiency in stations | As we know Indian families, to send one person many people come to just send him. So, we should make proper arrangements for car, bike, etc parking space. | Sorting Algorithms |
| 9 | City promotions | Providing city information like what it is famous for, etc at respective stations. | Heaps |
| 10 | Work space provisions | Ensuring the provision of adequate facilities and workspace for individuals during their waiting period for trains, as needed. | Linked Lists |

Anirudh R H

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| Problem Statement: Passenger comfort and Amenities | | | |
| S.Num | Functionality | Description | Tools |
| 11 | Platform Assistance | Helping passengers find their way around the train station, providing real-time updates and guidance through digital signs, apps, or staff. | Arrays/linked lists |
| 12 | Passenger Accommodation | Ensuring comfortable seating, sufficient legroom, and amenities like charging ports for a pleasant travel experience. | linked lists |
| 13 | Shop Location Generator | Simplifying shopping at the station by offering tools like apps or kiosks that guide passengers to nearby shops. | Hash Map |
| 14 | Toilets and Toiletries | Maintaining clean and well-equipped restrooms on trains and at stations, with essential toiletries for passenger hygiene. | linked lists |
| 15 | Drinking water facilities | Installation of water dispensers at strategic locations in stations and within train cars to provide passengers with convenient access to clean drinking water. | linked lists |
| 16 | Rest Areas | Designating comfortable spots within stations for passengers to relax, featuring seating, charging stations, and possibly recreational facilities. | trees |
| 17 | Person-to-Person Assistance | Providing real-time assistance to passengers through station staff or digital platforms for inquiries and guidance. | queues |
| 18 | Lounges for Long Journey trains | Establishment of exclusive lounges featuring comfortable seating, refreshments, and entertainment options for passengers on extended train journeys. | arrays/lists |
| 19 | Dormitories for accommodations at stations | Provision of budget-friendly sleeping accommodations within or near stations for passengers requiring overnight stays or layovers. | Linked lists |
| 20 | City Promotions | Collaboration with local businesses and tourism boards to promote city attractions and services at train stations, enriching the passenger experience with destination-related information | linked lists |

Abhishek B R

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| Sustainability and Green Initiatives | | | |
| Sl. No. | Functionality Identified | Description | Probable tools |
| 1 | Proper A/C Settings | Measure frequency of usage of each degree and using it as primary one when ac is made on.Storing historical data and allowing you to analyse patterns and set optimal temperature ranges, etc. | Hashing- to find frequent degree, Arrays/Linked lists- to store data |
| 2 | Maintenance of Hygiene in Trains | We can represent each waste bin as a node and when its full, we use deletion operation by generating signal to cleaning staff. | Linked list |
| 3 | Proper Recycle of Waste | Representing each bin uniquely and whenever the train arrives, waste from each bin is enqueues ensuring first in first out order . This creates an organised way of waste collection and recycling | Queues |
| 4 | Green Initiatives | We can reduce carbon emission by historical data of train movements and store somewhere and utilize it to solve such problems and minimize negative impacts on nature | Arrays |
| 5 | Real-Time Monitoring | We can store data of arrival timings of train at different stations anywhere and higher authorities can monitor it and optimize schedules and predict delays. Via network this information gets updated at station | Arrays, Structures |
| 6 | Assisting Passengers in Train | We can store all information of passengers ,updating it at station and assisting passengers with specific needs and ensuring that they reach their destination safely | Arrays, Structures |
| 7 | Work Space Provisions | If we have multiple trains travelling on same track then we can store their information such as departure time, destination , expected arrival and stop before any train clashes and even train delays and cancelations can be managed. | Linked list |
| 8 | Wi-Fi Facilities | We can prioritize and control access by First in first out system . Passengers who request to join are enqueued and wifi speed and limit is decided by factors like ticket class, etc which enhances overall quality of service | Queues |
| 9 | Modernized Infrastructure | We can store each seat as an element of array and mark as booked and available which simplify the ticket issuing procedure. We can even use linked lists to manage schedules of each train by storing their details. | Arrays, Linked lists |
| 10 | Signals and Communication System | We can store the data of trains and use it to properly dispatch trains from station. An example is, Trains arriving at station are recorded and trains leave in first in first out manner which smoothens the flow of traffic and minimize the delays that might have occurred | Queue |