2.1 Introduction to Analysis

Analysis is a vital aspect in any system development. Here, we identify the requirements, feasibility of the system under several areas using appropriate analysis methodology. After that we under go in preparation of preparing various models like Use Cases and Initial Class Diagram, which provides certain vision what we actually identified during analysis.

Regarding to my project, Mark Sheet Generator, which is totally based on student's data management dealing with students' progress reports. Therefore, for this project data management concept is essential aspects.

2.2 Analysis Methodology

Several Analysis Methodology can contribute in analysis. Despite, Hard System Methodology seem to be appropriate for my project, Mark Sheet Generator.

Hard System Methodology is analysis methodology that undergoes by following certain rules, guidelines and standards. Therefore, it is called as highly structured approach. It is suitable for small project like ours. In Hard approach we will be preparing logical data modeling, Data flow Diagram, etc. Hard approach is likely to called as Structured System Analysis Design Methodology (SSADM), which poses mainly three views that helps in analysis. Three views of SSADM are:

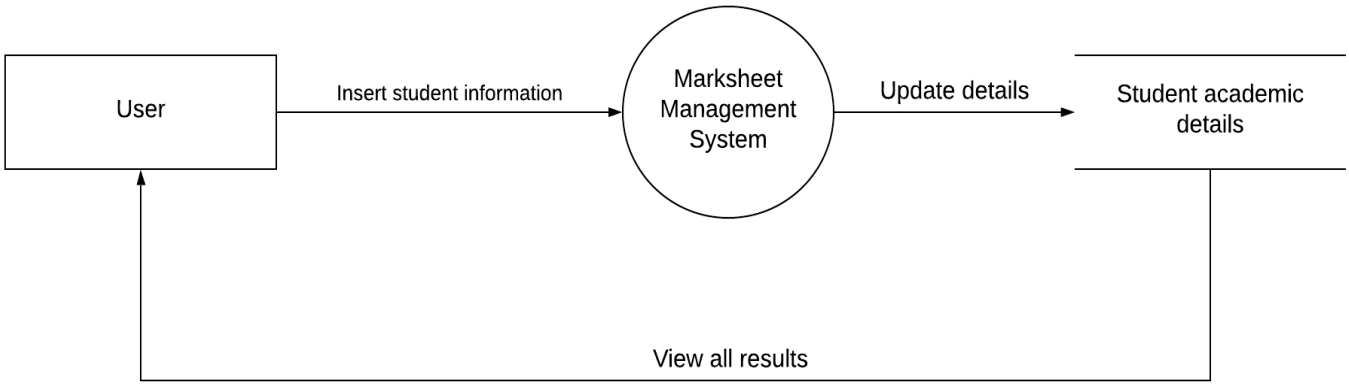
Process view, defines functions like storing database of the students, preparing mark sheet that system should carry, how data like students details, students obtained marks will move in the entire system and how it changes as it is processed.

Data view, defines the data like students marks in respective test and information which system will be using.

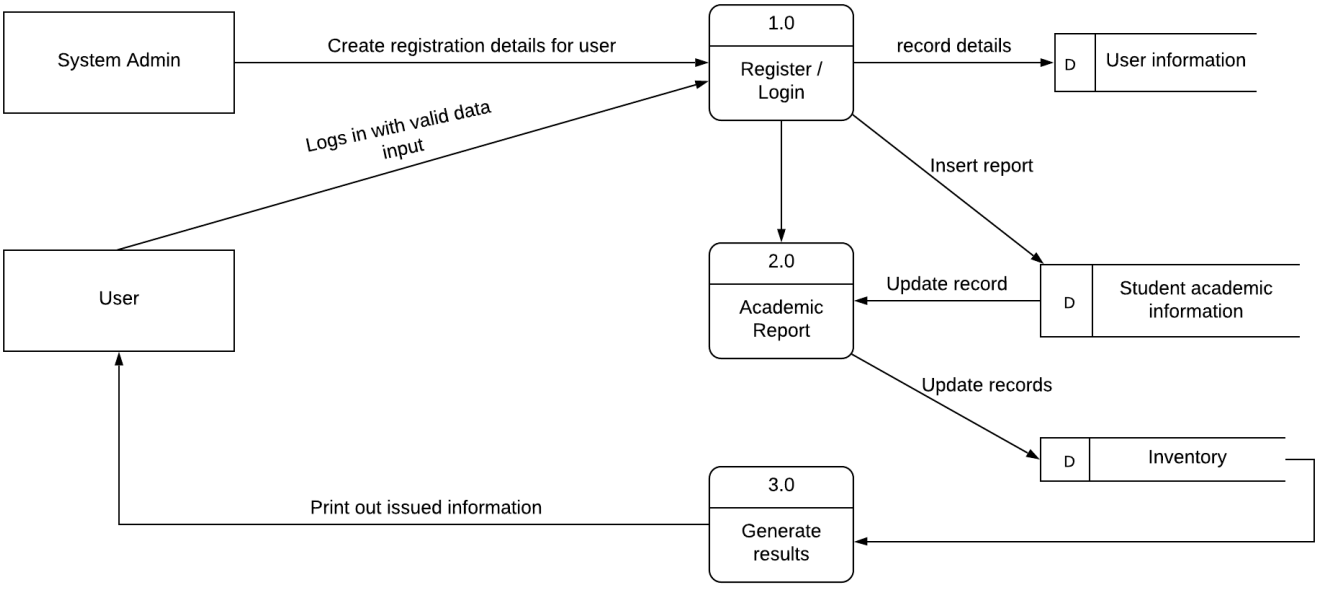
Event view, describes the events (print view, exporting data and so on) which helps in setting up of the processes running and the effect of the external events on the data.

As SSADM is being applied in this system for the development, we require to illustrate how data is stored, manipulated and flow throughout the system. These can be shown in Data Flow Diagram (DFD. The DFDs of this system are:

Level 0 DFD:



Level 1 DFD:



2.3 Feasibility Study

Feasibility study is what we do at initial level of system development that contribute in determining the technical, operational, financial, time factor, economical, legal, social and political aspects of the project. In these aspects of the study, we make sure that any of the feasible factors may not have any sorts of negative impact on our project. This is why we perform at initial level of the system development to sort out the negative sides, which can be obstacles or might cause problems in upcoming days.

The aspects of the feasibility study view based on this project is briefly explained below.

- Technical: Technically this project Mark Sheet Generator is can be said as having good feasibility. As backend programming will be done using Object Oriented Principles, which makes codes systematic.
- Economical: As this project is small- scale project, this does not require huge budgeting. Economical prospective for this project is also feasible which can contribute for success of this project.
- Time: By making a time- schedule, we can complete this project within certain time. Allocation of specific time for specific task can result in positive outcomes. This way time is also feasible for this project.
- Social: Socially, this system has wider acceptance. As this system will be in use by any educational institution to serve the progress reports of the students and keeping proper records of the students. This means this system does not affect any sorts of social believes and has greater feasibility.
- Legal: Legally it is does not hamper in system development. The system will be developed under legal alliances.
- Political: This system does not concern about any political issues. As the system will be concerned with educational institution, not to any governmental bodies.

2.4 SRS (Software Requirement Specification)

Software Requirement Specification is where all the system requirements are mentioned. SRS allows users to analyze if the requirements in it are as per their requirements. It consist of user requirements of system also complete specifications of the system requirements.
(softwarerequirementsspecification, 2019)

2.4.1 Functional Requirement

A statement of all the planned function of a system is term as functional requirement. It let know about the preferred end function of the system to guarantee the design is suitable to create the chosen product.
(functional-requirements, 2019)

The functional requirement of this system is:

ID	Title	Description	Rational	Dependency	Remarks
F001	User Registration	New users are to fill some data to be registered to use the system.	To register user with valid their valid identity.	N/A	
F002	User login	Users' username and password are to be provided to get access into the system.	To sustain confidentiality, integrity, and authenticity by providing access to verified users Only.	F001	
F003	Class Entry	User is able to entry the different level of grades as per the need.	To add classes for sorting out the students records.	F002	
F004	Update &Delete Class	Any changes in insertion of class data is possible.	To edit existing records and to maintain integrity.	F003	
F005	Section Entry	Section entry is available to user for multiple number of sections in each classes.	To add sections as per need for easy in sorting.	F002	
F006	Update &Delete Section	Modification in sections is made possible to user.	To edit in available records and maintain the data integrity.	F005	
F007	Examination Type Entry	Different categories of examinations can be enter by users.	To classify the different types of examination.	F002	
F008	Update &Delete Examination Type	Changes if needed is possible to perform.	To edit in available records and maintain the data integrity.	F007	
F009	Subjects Entry	Various subjects name can be entry by the user.	To add subjects to entry obtained marks in different subjects.	F002	
F0010	Update &Delete Subjects	The users can perform required modification.	Edit of data to maintain the accuracy and to maintain integrity of records.	F009	

F0011	Remarks Entry	Various remarks can be written.	To add remarks in mark sheet to provide feedbacks for encouragement.	F002	
F0012	Update &Delete Remarks	Changes in remarks are possible	Editing in existed records to sustain the accuracy.	F0011	
F0013	Students Detail Entry	Students' detail information can be filled up.	To add classes for sorting out the students records.	F002	
F0014	Update & Delete Students Detail	Any changes or delete can be made.	To edit the records to maintain integrity.	F0014	
F0015	Full/ Pass marks Entry	The users can provide full marks and pass marks for each subjects.	To add classes for sorting out the students records.	F002	
F0016	Update & Delete Full/ Pass marks	Marks can be alter as per need.	To edit the records to maintain integrity.	F0016	
F0017	Obtained Marks Entry	Students marks obtained can be enter by the users	To add classes for sorting out the students records.	F002	
F0018	Update & Delete Obtained Marks	The users if required can make certain changes.	To edit the records to maintain integrity.	F0017	
F0019	Generate Mark Sheet	Mark Sheet can be prepared by calculating all the marks obtained.	To view the students performance.	F002, F003, ,F005, F007, F009, F0011, F0013, F0015, F0017	
F0020	View Mark Sheet in pdf	Prepared mark sheet can be viewed in pdf	To view and download in the system so to view easily.	F0019	
F0021	Import / export Database in excel file format	Student database can be import and export to excel file	To keep the backups and maintain the availability.	F002	
F0022	Search student by name, class, roll number	Searching of students data by their name, class and roll number is possible.	To view the records and to maintain availability.	F002	

2.4.1 Non- Functional Requirement

Nonfunctional requirements are quality attributes of the system that deals with the usability, reliability, security, performance, scalability and so on.
Some of the nonfunctional requirements for this system are:

ID	Title	Description	Rational	Dependency	Remarks
NF001	Security	System should be secure from different attacks and malwares.	To protect and secure the data.	N/A	
NF002	Reliability	System should perform the task as intended.	To make system reliable	NF001	
NF003	Concurrency	System should able to create and maintain security to multiple users.	To maintain privacy in multiple users.	NF001	
NF004	Backup and recovery	Data backup provision must be available in the system.	To maintain backups.	NF002	
NF005	Accuracy	System should provide accurate data.	To make system accurate.	NF001,NF002,NF006	
NF006	Scalability	System should hold data for long-term use as per the change in volume of data.	To make the system to hold large volume data by making it scalable,	NF002, NF004	
NF007	Error-Handling	Error handling guides should be provided to sort problems accurately.	To make the system work functioning to solve errors.	NF005, NF002	
NF008	Configurability	System should provide to update the user profile.	To facilitate users to edit their profiles if required.	NF002	
NF009	Testing	System should be able perform testing without difficulty.	To make the system easily testable.	NF002,NF006	

2.4.3 M_oSC_oW Prioritization

M_oSC_oW Prioritization is a methodology, which prioritized the requirements to prevent them from being expensive or unrealistic. The prime motive is to take such requirements that are the most valuable for the system.

The acronym of M_oSC_oW is:

M= Must have
S= Should have
C= Could have
W= Won't have

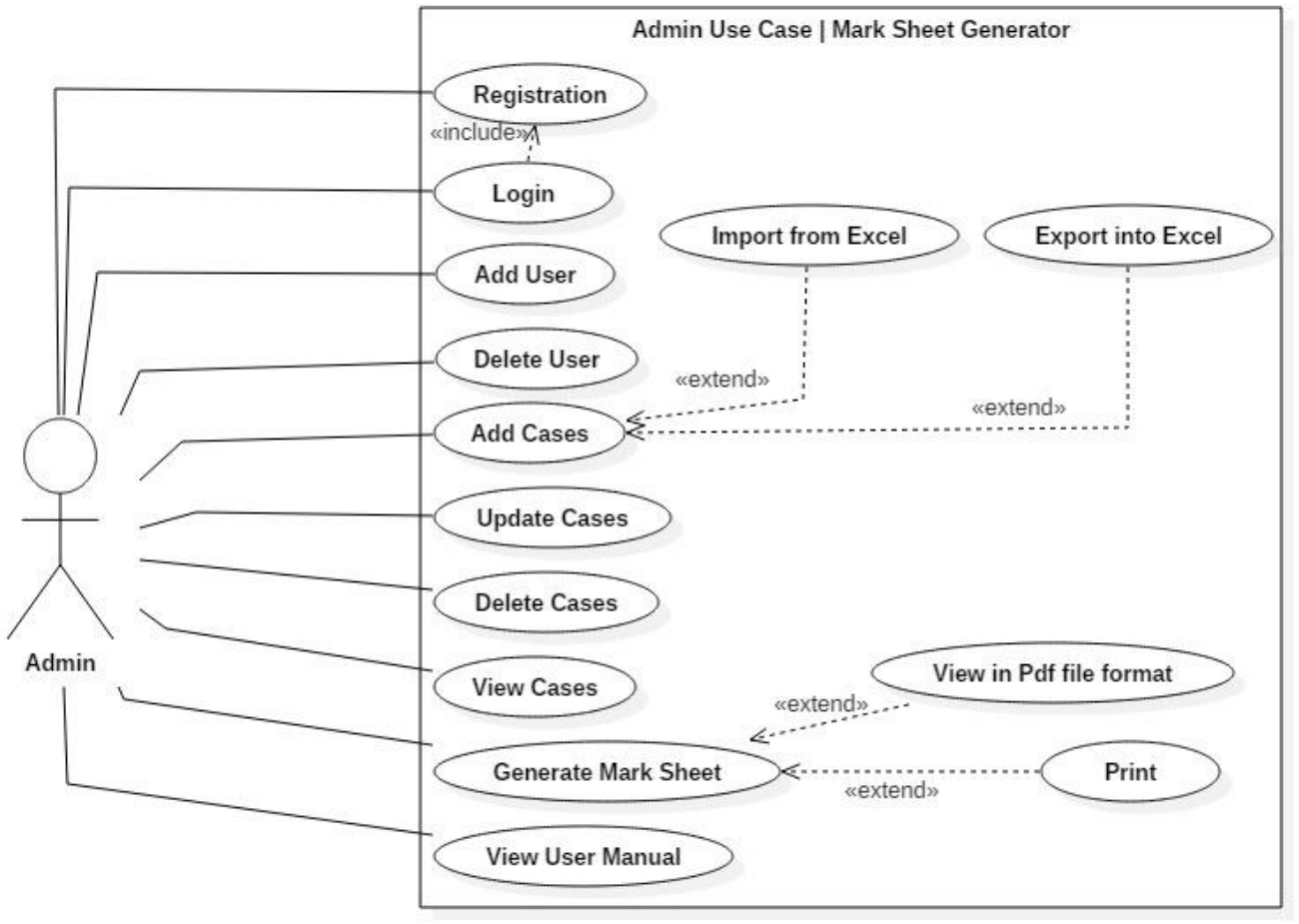
Functional		
Requirement ID	**Title**	**M_oSC_oW Prioritization**
F001	User Registration	M
F002	User login	M
F003	Class Entry	M
F004	Update &Delete Class	M
F005	Section Entry	S
F006	Update &Delete Section	S
F007	Examination Type Entry	M
F008	Update &Delete Examination Type	M
F009	Subjects Entry	M
F0010	Update &Delete Subjects	M
F0011	Remarks Entry	C
F0012	Update &Delete Remarks	C
F0013	Students Detail Entry	S
F0014	Update & Delete Students Detail	S
F0015	Full/ Pass marks Entry	M
F0016	Update & Delete Full/ Pass marks	M
F0017	Obtained Marks Entry	M
F0018	Update & Delete Obtained Marks	M
F0019	Generate Mark Sheet	M
F0020	View Mark Sheet in pdf	S
F0021	Import / export Database in excel file format	M
F0022	Search student by name, class, roll number	C
Non- Functional		
NF001	Security	S
NF002	Reliability	C
NF003	Concurrency	W
NF004	Backup and recovery	M
NF005	Accuracy	M
NF006	Scalability	M
NF007	Error-Handling	C
NF008	Configurability	W
NF009	Testing	S

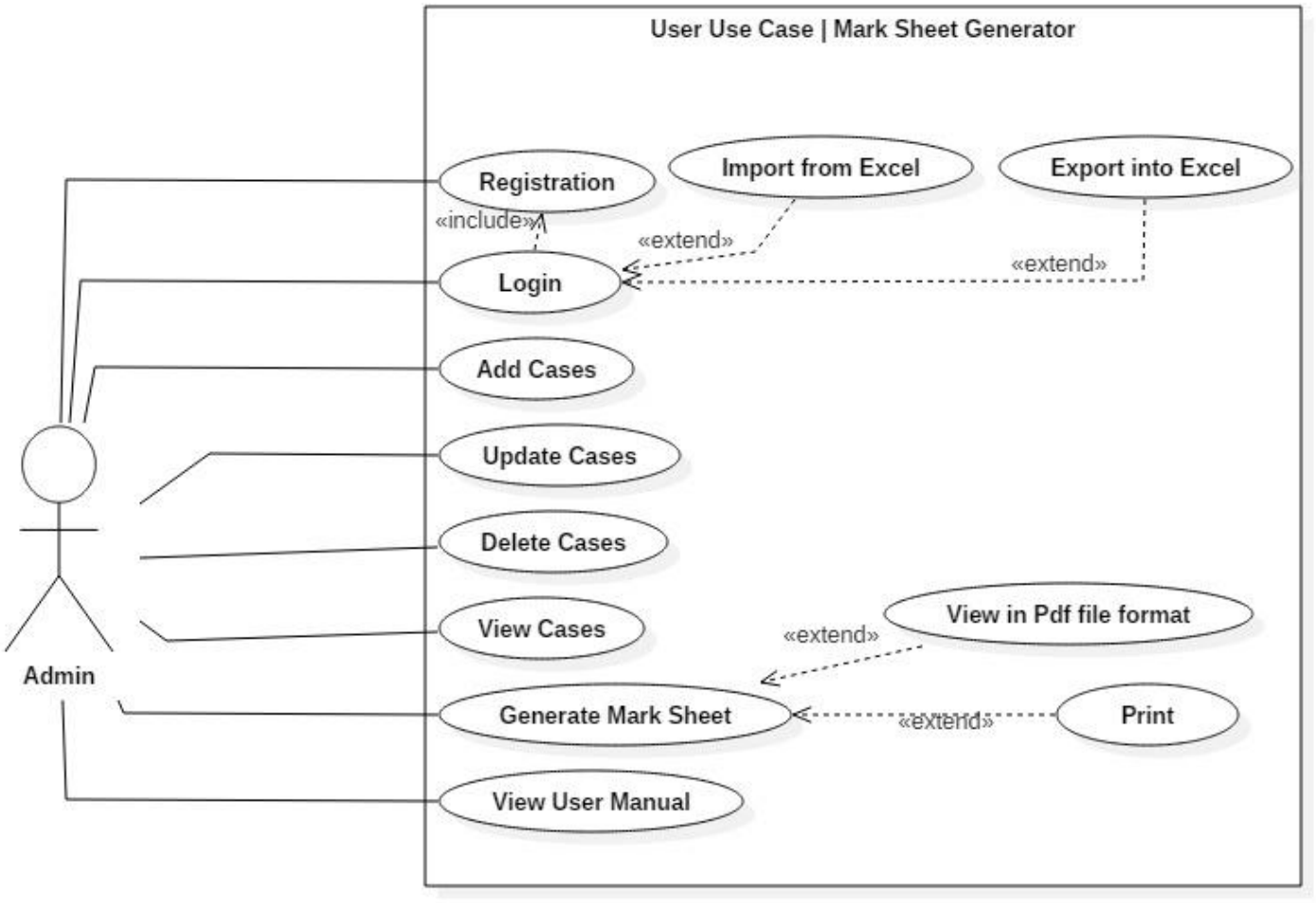
2.4.4 Hardware Software Specification

Hardware Software Specification		
	Minimum	**Recommended**
OS	Windows (x86)	Windows (x64)
Processor	1.8GHz or faster i3 coffee lake edition or higher required	i7 8700K intel
RAM	2 GB	4 GB or higher preferable
Storage	20 GB	Higher is recommended

2.5 Use Case Diagram

Use case Diagram is a diagram that provide the details of the interaction between the users (actors) and the system. Here, we use specialized symbols and connectors. It displays the different ways of interactions of users and the system.
The Use Cases for this system are:




User Use Case | Mark Sheet Generator
Registration
Import from Excel
Export into Excel
«include»
«extend»
«extend»
Login
Add Cases
Update Cases
Delete Cases
View Cases
View in Pdf file format
«extend»
Admin
Generate Mark Sheet
«extend»
Print
View User Manual

Title: “Registration”

ID	UC1
Justification	A use case where user inputs their valid credentials to be authorized.
Primary Actor(s)	Admin or Normal User
Supporting Actor(s)	N/A
Primary Flow	1. User enter their valid credential. 2. User will save their data by clicking on save button. 3. System will save the data into the database. 4. System will navigates to the login Page.
Alternative Flow	1. User inputs invalid data into the field. 2. System identifies the validation annotation. 3. System sent error message for invalid inputs. 4. User expected to correct the field data. 5. Repeat from step 2 of Alternative Flow until correct input.

Title: “Login”

ID	UC2
Justification	A use case which valid other use cases to operate unless it is authorized.
Primary Actor(s)	Admin or Normal User
Supporting Actor(s)	N/A
Primary Flow	5. User enter their valid credential. 6. User entered data will be verified. 7. User get access into the system.
Alternative Flow	6. User inputs invalid data into the field. 7. System identifies the validation annotation. 8. System sent error message for invalid inputs. 9. User expected to correct the field data. 10. Repeat from step 2 of Alternative Flow until correct input.

Title: “Add Case”

ID	UC3
Justification	A use case, which facilitate to insert data into the system.
Primary Actor(s)	Admin or Normal User
Supporting Actor(s)	N/A
Primary Flow	1. User enter their valid credential. 2. User entered data will be verified. 3. User get access into the system. 4. User navigates to Add section and click on Add button, 5. User inputs the data in the field. 6. System saves the data into database after user clicks on Save button.
Alternative Flow	1. User inputs invalid data into the field. 2. System identifies the validation annotation. 3. System sent error message for invalid inputs. 4. User are expected to correct the field data. 5. Repeat from step 2 of Alternative Flow until correct input.

Title: “View Case”

ID	UC4
Justification	A use case that displays all the existing data .i.e. Retrieves all the existence data.
Primary Actor(s)	Admin or Normal User
Supporting Actor(s)	N/A
Primary Flow	1. User enter their valid credential. 2. User entered data will be verified. 3. User get access into the system. 4. User navigates to View and click on View button, 5. System shows all the present data.
Alternative Flow	N/A

Title: “Update Case”

ID	UC5
Justification	Vital use case to edit unidentified invalid inputs in order to maintain data integrity and reliability.
Primary Actor(s)	Admin or Normal User
Supporting Actor(s)	N/A
Primary Flow	1. User enter their valid credential. 2. User entered data will be verified. 3. User get access into the system. 4. User navigates to View and click on View button, 5. System shows all the present data. 6. User will change the invalid inputs and enter the correct one. 7. User will click on the button Update. 8. System will save the changes. 9. System navigates to the view page where all the is displayed.
Alternative Flow	1. User inputs invalid data into the field. 2. System identifies the validation annotation. 3. System sent error message for invalid inputs. 4. User are expected to correct the field data. 5. Repeat from step 2 of Alternative Flow until correct input.

Title: “Delete Case”

ID	UC6
Justification	Any irrelevant data entered in the system can be removed by using this use case.
Primary Actor(s)	Admin or Normal User
Supporting Actor(s)	N/A
Primary Flow	1. User enter their valid credential. 2. User entered data will be verified. 3. User get access into the system. 4. User navigates to View and click on View button, 5. System shows all the present data. 6. User select the irrelevant data. 7. User will click on the button Delete. 8. System will send a confirmation message box. 9. User accepts and then selected data is erased from the system. 10. User will now click on save button. 11. System will save the changes. 12. System navigates to the view page where all the is displayed.
Alternative Flow	1. User might use check marks for multiple selection of data to delete. 2. User might reject the confirmation.

Title: “Search Case”

ID	UC7
Justification	User can get the specific data they require by possible match inputs. This is beneficiary to take data from large volume.
Primary Actor(s)	Admin or Normal User
Supporting Actor(s)	N/A
Primary Flow	1. User enter their valid credential. 2. User entered data will be verified. 3. User get access into the system. 4. User navigates to View and click on View button, 5. System shows all the present data. 6. User inputs specific strings to search. 7. System will display the data without reload of the page. 8. System navigates to the view page where all the is displayed.
Alternative Flow	1. User enter data could not be matched. 2. No record found message would be displayed.

Title: “Generate Mark Sheet”

ID	UC8
Justification	User can get Mark Sheet using this use case where percentage, grades, ranks are being calculated and is being displayed.
Primary Actor(s)	Admin or Normal User
Supporting Actor(s)	N/A
	4.
Primary Flow	1. User enter their valid credential. 2. User entered data will be verified. 3. User get access into the system. 4. User navigates to View Result and click on View Result button. 5. System automatically calculates the total obtained marks and gives percentage. 6. System produce rank automatically based on calculated obtained marks and percentage. 7. User will view Ledger view of Mark sheet.
Alternative Flow	1. User can view in Mark Sheet Format by clicking on Print View. 2. User can download in pdf format. 3. User can print hard copy by local printer.

Title: “User Manual”

ID	UC9
Justification	A use case where user will get the help and guidance to deal with
Primary Actor(s)	Admin or Normal User
Supporting Actor(s)	N/A
Primary Flow	1. User logged into the system by giving input their valid credential. 2. User will navigate to View User manual. 3. System displays the Manual Page. 4. User read the manual displayed.

1.5 Initial Class Diagram

A diagram that is produced to represent the relationship between classes of the system is called class diagram. It also consists of attributes of the classes with their operations. Class diagram is part of a unified modeling language (UML).

In order to make class diagram we perform NLA (Natural Language Analysis).

Scenario

Mark Sheet Generator is an academic system can be fruitful in any educational institution. Students detail information is maintained by this system. It is desktop application. This system prepare mark sheet of students. For this user will have to input the subjects, examination type and obtained marks. After this this system produces mark sheet with automation of rank.
User level privilege is also provided in this system. Admin can create and delete the users. Rest other features are provided to both admin and normal users.

NLA (Natural Language Analysis)

NLA is the process of identifying nouns as potential classes, verbs as potential function and adjectives as potential attributes.

Initial step to proceed NLA is to identify the nouns, adjectives and verbs from the scenario of the system.

Here we find out the nouns, adjectives and verbs as classes, attributes and functions from the scenario.

Nouns	Adjectives	Verbs
Mark Sheet Generator	Name	Add
System	Address	Update
Students	Email	Delete
User Type	Contact	Create
Admin	Rank	View
Examination	Marks obtained	Generate
Result	Section	Produces
Subjects	Parents Name	
Class	Date	

Now we filter the similar, irrelevant values

Nouns	Adjectives	Verbs
Mark Sheet Generator (Irrelevant)	Name	Add
System (Irrelevant)	Address	Update
Students	Email	Delete
User (User Type is renamed as User)	Contact	Create
Admin (Duplicate with users)	Rank	View
Examination	Marks obtained	Generate(Duplicate with Create)
Result	Section	Produces (Duplicate with Create)
Subjects	Parents Name	
Class	Date	

Therefore, we get the following information to produce initial class diagram.

Nouns	Adjectives	Verbs
Students	Name	Add
User	Address	Update
Examination	Email	Delete
Result	Contact	Create
Subjects	Rank	View
Class	Marks obtained	
	Section	
	Parents Name	
	Date	

The Initial Class Diagram of the Mark Sheet Generator is: