CHAPTER 3

SYSTEM DESIGN

System design is the process of defining the architecture, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. It is meant to satisfy specific needs and requirements of a business or organization through the engineering of a coherent and well-running system.

3.1 ER Diagram

An entity relationship diagram (ERD) shows the relationships of entity sets stored in a database. An entity in this context is an object, a component of data. An entity set is a collection of similar entities. These entities can have attributes that define its properties. By defining the entities, their attributes, and showing the relationships between them, an ER diagram illustrates the logical structure of databases. ER diagrams are used to sketch out the design of a database. Figure 3.1 depicts the ER diagram of GMS. It shows various entities, their attributes, relationships with other entities, cardinality ratios between entities and participation constraints used in designing GMS database.
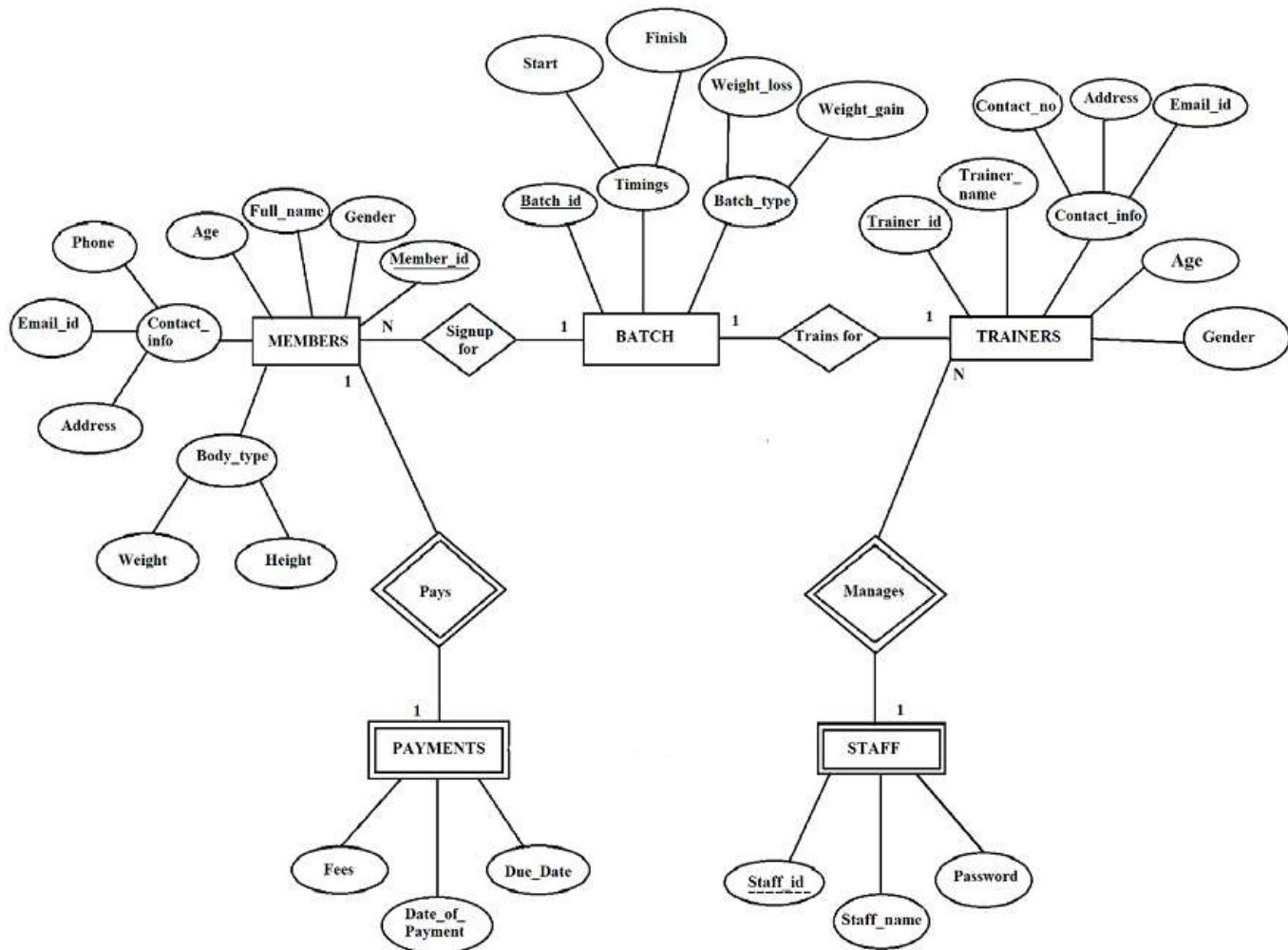
Fig 3.1: *ER diagram of GMS*

3.2 Schema Diagram

A schema is the structure behind data organization. It is a visual representation of how different table relationships enable the schema's underlying mission business rules for which the database is created. In a schema diagram, all database tables are designated with unique columns and special features, e.g., primary/foreign keys or not null, etc. Formats and symbols for expression are universally understood, eliminating the possibility of confusion. The table relationships also are expressed via a parent table's primary key lines when joined with the child table's corresponding foreign keys.

Schema diagrams have an important function because they force database developers to transpose ideas to paper. This provides an overview of the entire database, while facilitating future database administrator work. Figure 3.2 shows the schema diagram of GMS.
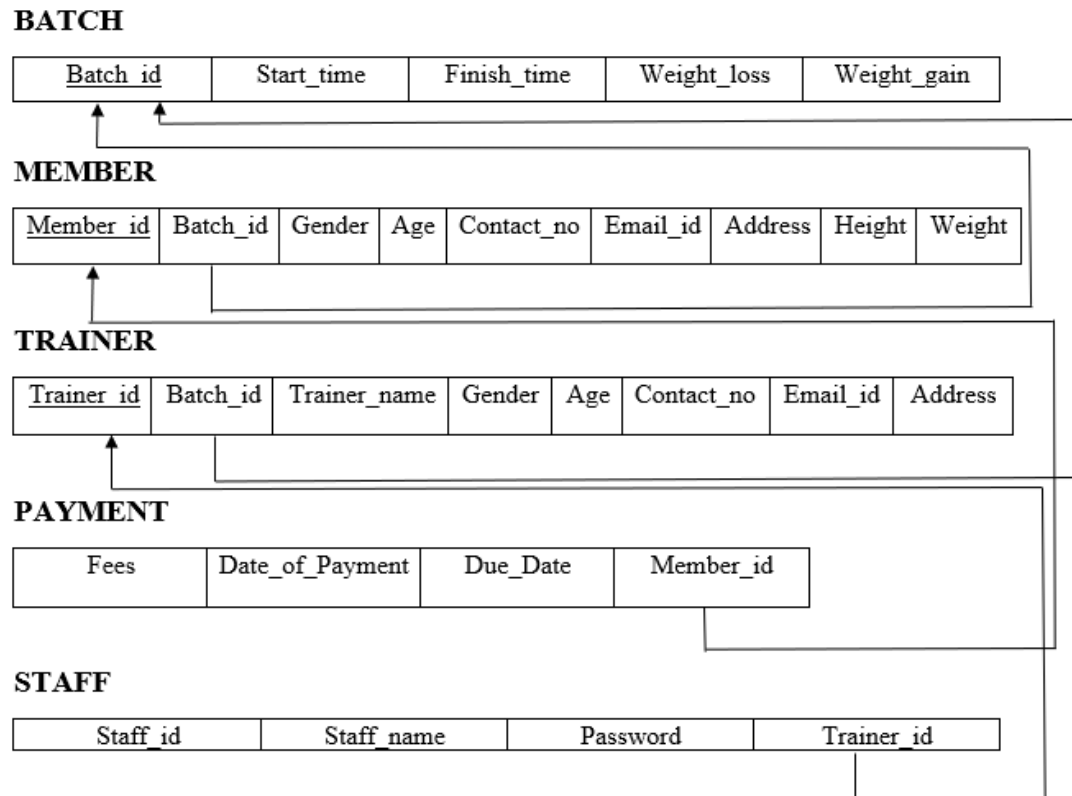
BATCH

Batch_id	Start_time	Finish_time	Weight_loss	Weight_gain

MEMBER

Member_id	Batch_id	Gender	Age	Contact_no	Email_id	Address	Height	Weight

TRAINER

Trainer_id	Batch_id	Trainer_name	Gender	Age	Contact_no	Email_id	Address

PAYMENT

Fees	Date_of_Payment	Due_Date	Member_id

STAFF

Staff_id	Staff_name	Password	Trainer_id

Fig 3.2: Schema Diagram of GMS

3.3 Database Table Design

The basic database unit is the table. A table is a unit consisting of rows of related information. Each row consists of fields of information where data is stored. Field attributes include information and rules that govern the data stored in the field. The field attributes and rules may limit the type of data stored in the field.

A field may be defined as a key or may be limited by rules requiring specific masks, such as a field may limited to dates, formatted numbers like telephone numbers, or be limited to a specific number of characters. The database schema contains these rules. Database tables used in GMS are shown below.

Table 3.1: BATCH

Name	Data Type	Constraints
Batch_id	Varchar(10)	Primary Key
Start_time	Varchar(20)	
Finish_time	Varchar(20)	

Weight_loss	Varchar(30)	
Weight_gain	Varchar(30)	

Table 3.1 is used to store batch related information like Batch_id, Start_time, Finish_time, Weight_loss, Weight_gain when new batch is added to gym by the staff.

Table 3.2: MEMBER

Name	Data Type	Constraints
Full_name	Varchar(20)	
Member_id	Varchar(10)	Primary Key
Batch_id	Varchar(10)	Foreign Key
Gender	Varchar(10)	
Age	Int(11)	
Contact_no	Varchar(15)	
Email_id	Varchar(30)	
Address	Varchar(50)	
Weight	Decimal(10,2)	
Height	Decimal(10,2)	

Table 3.2 is used to store member related information like Full_name, Member_id, Batch_id, Gender, Age, Contact_no, Email_id, Address, Weight, Height .

Table 3.3: TRAINER

Name	Data Type	Constraints
Trainer_name	Varchar(20)	
Trainer_id	Varchar(10)	Primary Key
Batch_id	Varchar(10)	Foreign Key
Gender	Varchar(10)	
Age	Int(11)	
Contact_no	Varchar(15)	
Email_id	Varchar(30)	
Address	Varchar(50)	

Table 3.3 is used to store trainer related information like Trainer_name, Trainer_id , Batch_id, Gender, Age, Contact_no, Email_id, Address.

Table 3.4: PAYMENTS

Name	Data Type	Constraints
Member_id	Varchar(20)	Foreign Key
Fees	Decimal(10,2)	

| Date_of_Payment | date | |
| Due_ Date | date | |

Table 3.4 is used to store payment related information like Member_id, Fees, Date_of_Payment, Due_Date.

Table 3.5: STAFF

Name	Data Type	Constraints
Staff_id	Varchar(10)	
Staff_name	Varchar(20)	
Password	Varchar(20)	
Trainer_id	Varchar(10)	Foreign Key

Table 3.5 is used to store Staff information like Staff_id, Staff_name, Password, Trainer_id.

Virtual Table 3.6: GYM

Name	Data Type	Constraints
Member_id	Varchar(10)	
Full_name	Varchar(20)	
Batch_id	Varchar(10)	
Trainer_id	Varchar(10)	
Trainer_name	Varchar(20)	

Table 3.6 virtual table Gym that is derived from tables MEMBER and TRAINER is used to display list of members who joined particular batch and list of trainers who trains a particular batch.

3.4 Use case Diagram

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well. The use cases are represented by either circles or ellipses. Users interacting with application are shown outside with stickman symbol.
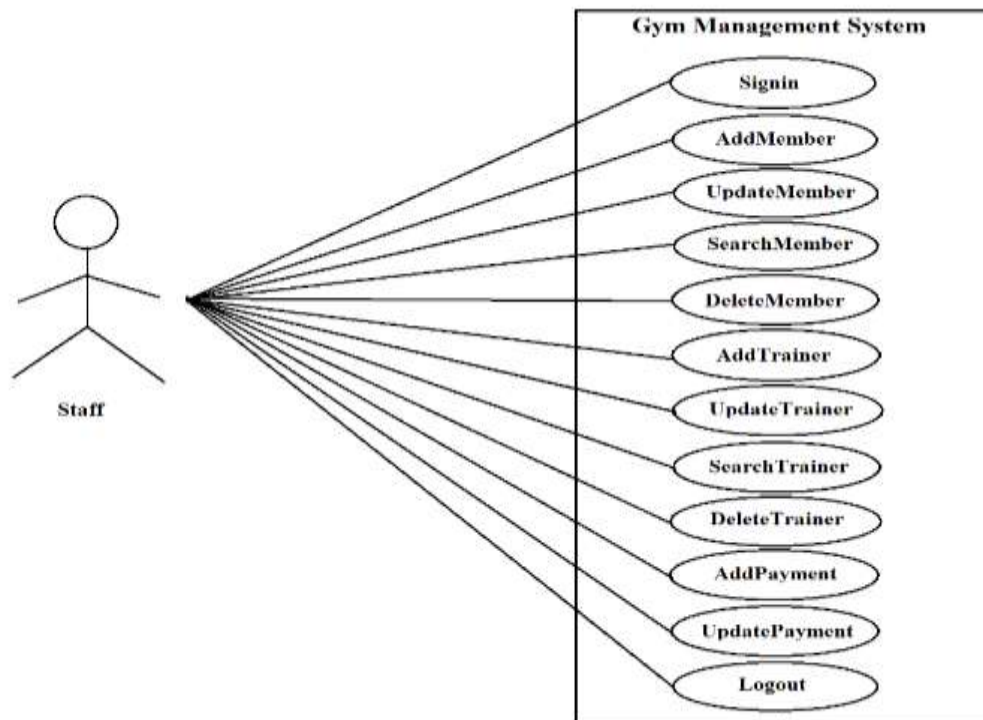
Fig 3.4: *Use case diagram of GMS*

3.5 Flow Chart

A flowchart is a type of diagram that represents an algorithm, workflow or process. The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This diagrammatic representation illustrates a solution model to a given problem. With proper design and construction, it communicates the steps in a process very effectively and efficiently. Figure 3.5 depicts the flow chart of GMS which shows various processing steps based on different events, actions and conditions.
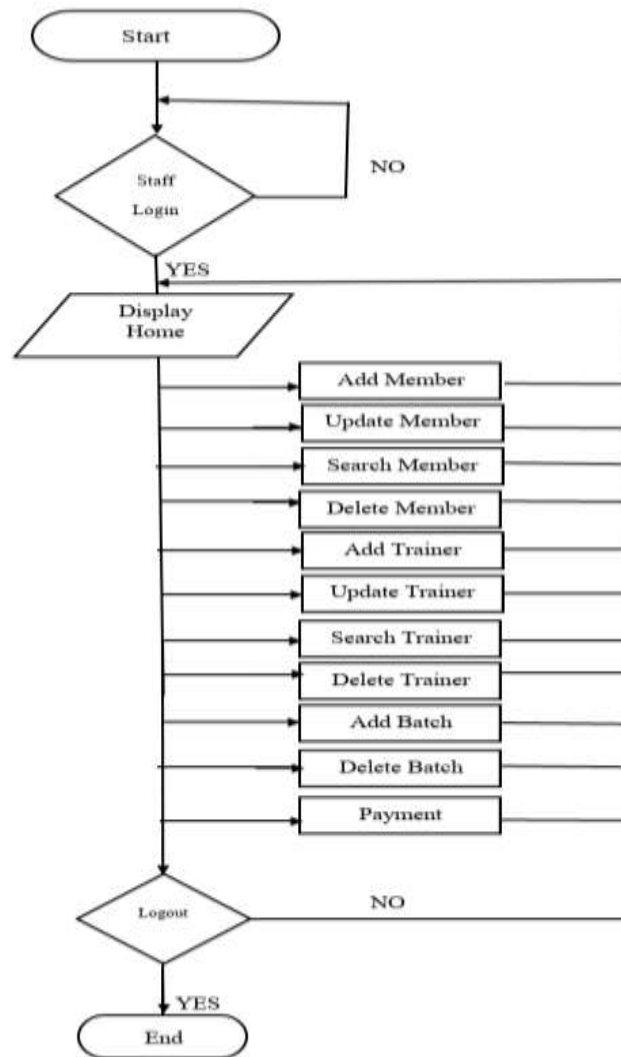
Fig 3.5: *Flowchart of GMS*