Project – Online Library Management System

1. Conceptual Diagram / Schema Diagram

Below is visual representation of database structure from our project sqlite database which helps to understand the relationship between entity, attributes, constraints and objects in order to design and maintain databases efficiently and to develop complex queries.

This conceptual diagram is consisting of several elements like

Tables - Represent a collection of related data.
Rows - Represent actual data store in table.
Columns - Define the structure of data in a table.
**Primary key** - Key which uniquely identify each row in a table.
Foreign Key - columns that reference the primary key of another table.
Relationships - How the tables in DB are related to each other.
Constraints - Rules that govern the data store in a table.

1.1 Tables

Below are the tables from our project database. We are using Django a Python based web framework to build our web application with sqlite database. It has built in user authentication and therefore, below are couple of tables being used for user management, authentication, authorization, and application content management. The library issued book is what will referenced to book repository.
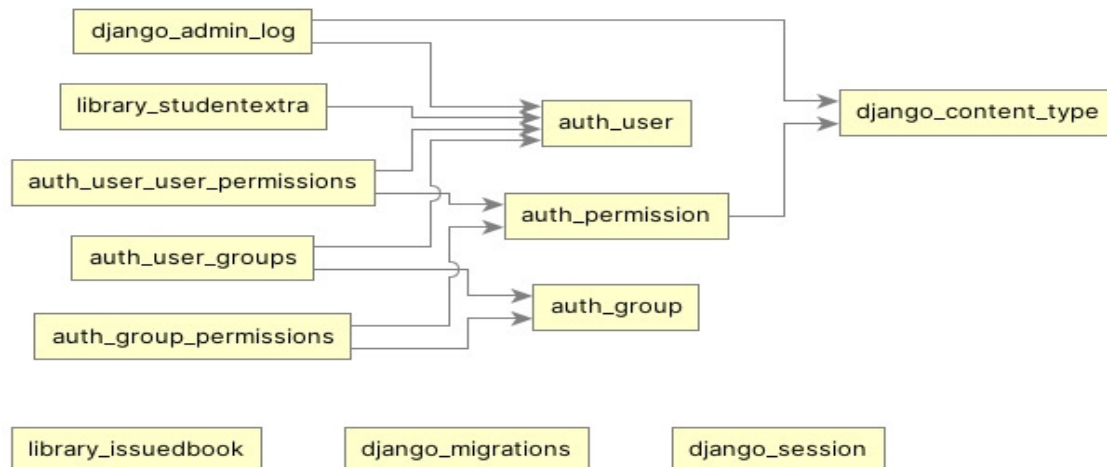
1.2 Database Schema Diagram

There is total 13 entities in this database and below diagram shows how they are connected to each other using primary and foreign keys and what is data type for each attribute. Some of the entity details are as below.

Auth_user – It has different data type for different attributes. It is an entity consisting of user login details to the application. It is used to define the user characteristics like first name, last name, join date, email, password, user state, and user permission level.

Auth_group - It is of VARCHAR type which provide the name of group user is member of.

Auth_group_permissions – it is INTEGER type which provides the details on what group is having what permission for authorization.
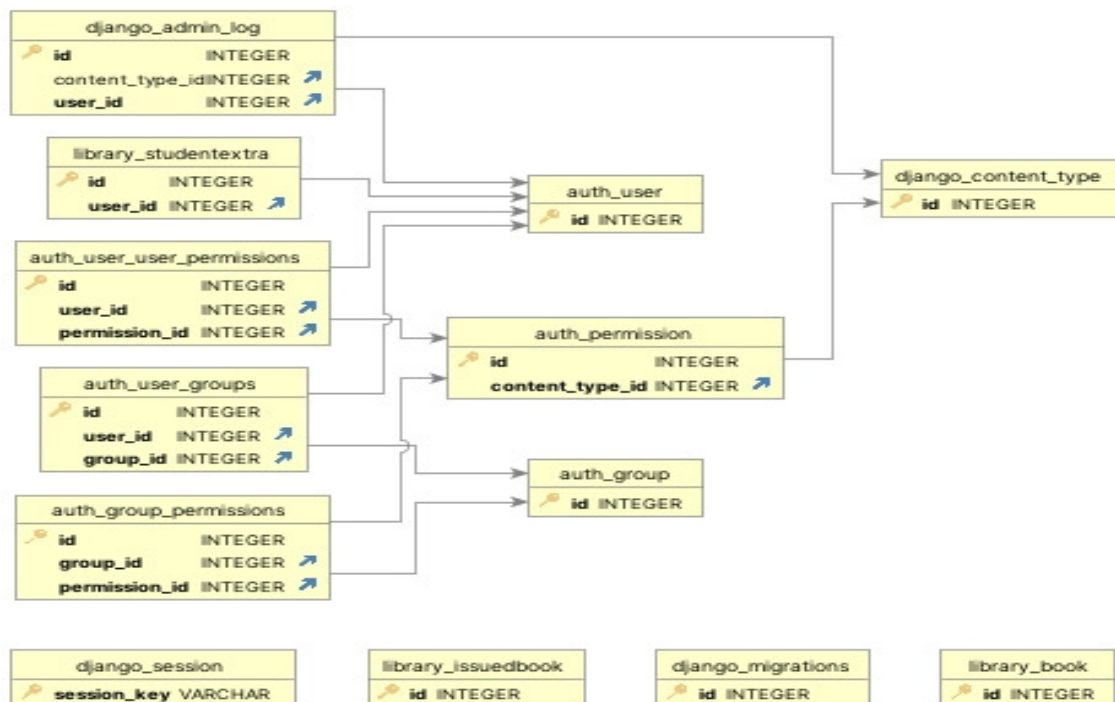
Library_issuedbook – It is of VARCHAR and DATE data type carrying the information about book issuance details.

Library_book – It is of VARCHAR data type having the information about the book in library repository.
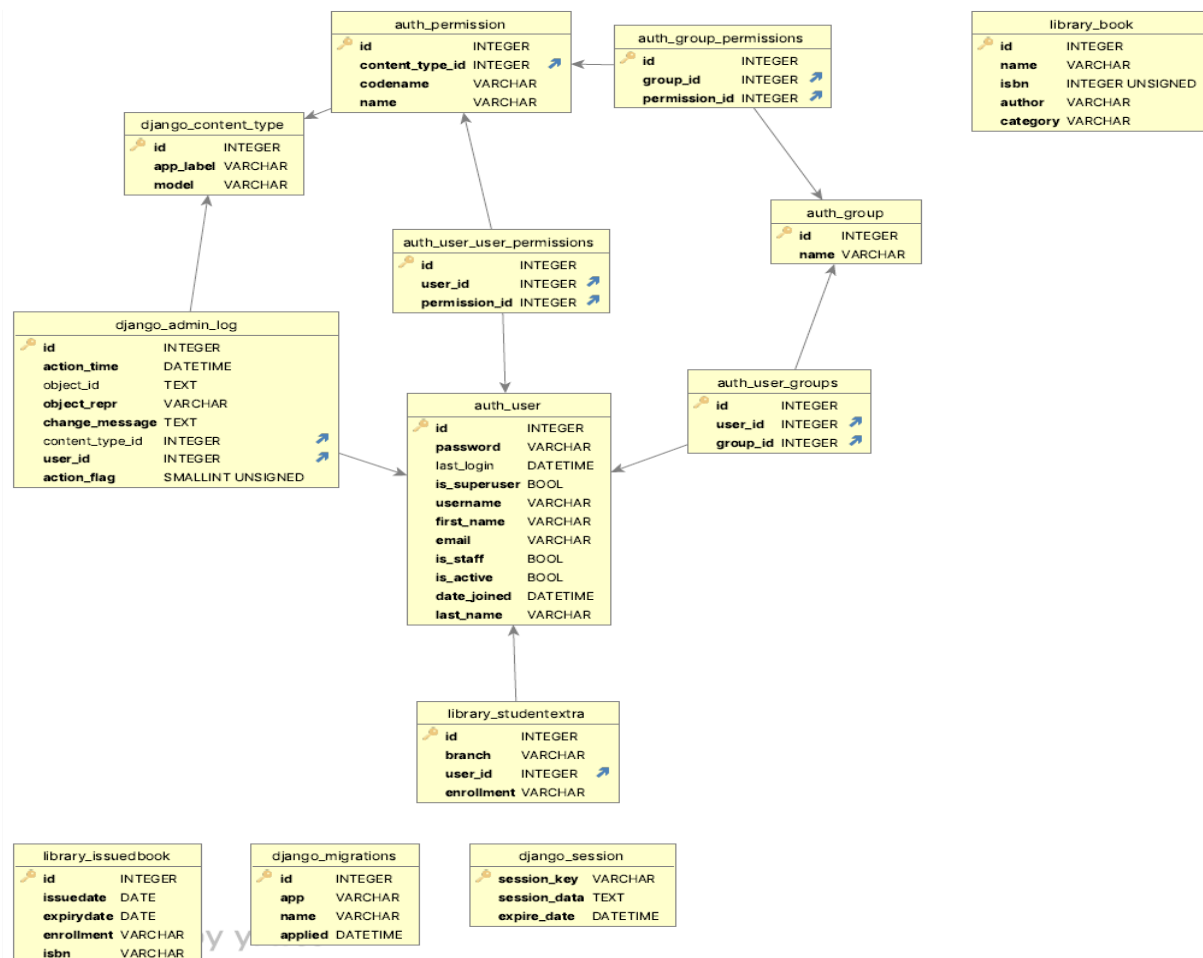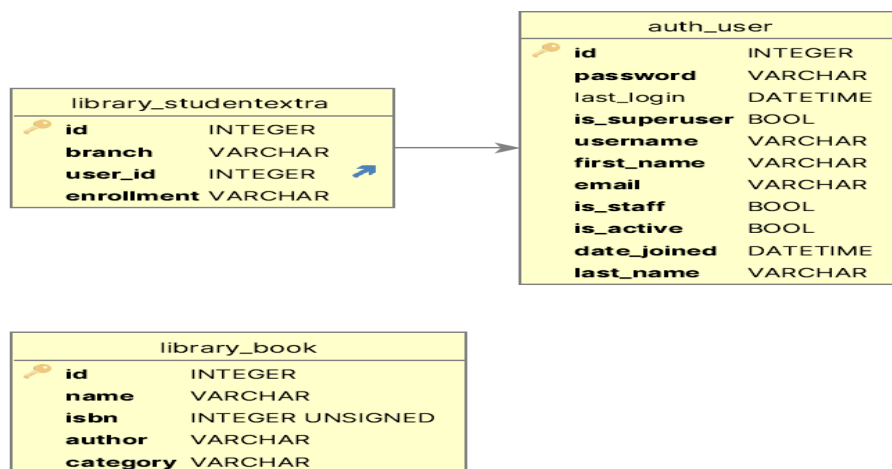

1.3 Primary Keys:

Below diagram shows the primary key in each table and the relationship based on the keys

1.4 Users Auth, Students and Library books:

Below is another view of users, student enrollment and library book

2. Database constraints

Constraints are the rules that are applied to one or more columns of a table to enforce business rules or data integrity rules. Constraints are to ensure the accuracy, consistency, and reliability of the data stored in a database. There are different types of constraints like Primary Key constraint, Foreign Key, Unique constraint, Check constraint, Not Null constraint.

We have used below constraint in our project database to ensure the integrity of our data in database.

- Check constraint
- Nullable Constraint
- Unique Constraint
- Foreign Key constraint

Check Constraint

Table	Constraint
Django_admin_log	"action_flag" >=0
Library_book	"isbn" >=0

Nullable Constraint

Table	Constraint
Django_admin_log	object_id , content_type_id
auth_user	content_type_id , last_login

Table: django_admin_log

Name	Data Type	Size	Scale	Nullable	Def
id	INTEGER		0	☐	
action_time	DATETIME		0	☐	
object_id	TEXT		0	☑	
object_repr	VARCHAR		0	☐	
change_message	TEXT		0	☐	
content_type_id	INTEGER		0	☑	
user_id	INTEGER		0	☐	
action_flag	SMALLINT UNSIGNED		0	☐	

Table: auth_user

Name	Data Type	Size	Scale	Nullable
id	INTEGER		0	☐
password	VARCHAR		0	☐
last_login	DATETIME		0	☑
is_superuser	BOOL		0	☐
username	VARCHAR		0	☐
first_name	VARCHAR		0	☐
email	VARCHAR		0	☐
is_staff	BOOL		0	☐
is_active	BOOL		0	☐
date_joined	DATETIME		0	☐
last_name	VARCHAR		0	☐

Unique Constraint

Table	Constraint
auth_group	name
auth_user	username
library_studentextra	user_id

Table: auth_group

Unique Constraints

Constraints

Constraint Name	Columns
	name

Constraint Columns

Column	Include

Table: auth_user

Columns | Primary Key | Foreign Keys | **Unique Constraints** | Check Constraints

Constraints

Constraint Name	Columns
	username

Table: library_studentextra

Columns | Primary Key | Foreign Keys | **Unique Constraints** | Check Constraints

Constraints

Constraint Name	Columns
	user_id

Foreign Key Constraint

Table	Constraints
Auth_group_permission	group_id , permission_id
Auth_permission	content_type_id
Auth_user_groups	user_id , group_id
Auth_user_user_permissions	user_id , permission_id
Django_admin_log	content_type_id , user_id
Library_studentextra	user_id

Table: auth_group_permissions

Columns | Primary Key | **Foreign Keys** | Unique Constraints | Check Constraints

Constraints

Constraint Name	Columns	On Delete Action	On Update Action
	group_id		
	permission_id		

Table: auth_permission

Columns Primary Key **Foreign Keys** Unique Constraints Check Constraints

Constraints

Constraint Name	Columns	On Delete Action	On Update Action
	content_type_id		

Table: auth_user_groups

Columns Primary Key **Foreign Keys** Unique Constraints Check Constraints

Constraints

Constraint Name	Columns	On Delete Action	On Update Action
	user_id		
	group_id		

Table: auth_user_user_permissions

Columns Primary Key **Foreign Keys** Unique Constraints Check Constraints

Constraints

Constraint Name	Columns	On Delete Action	On Update Action
	user_id		
	permission_id		

Table: django_admin_log

Columns Primary Key **Foreign Keys** Unique Constraints Check Constraints

Constraints

Constraint Name	Columns	On Delete Action	On Update Action
	content_type_id		
	user_id		

Table: library_studentextra

Columns | Primary Key | **Foreign Keys** | Unique Constraints | Check Constraints

Constraints

Constraint Name	Columns	On Delete Action	On Update Action
	user_id		