

Project – Online Library Management System

Team 02

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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.

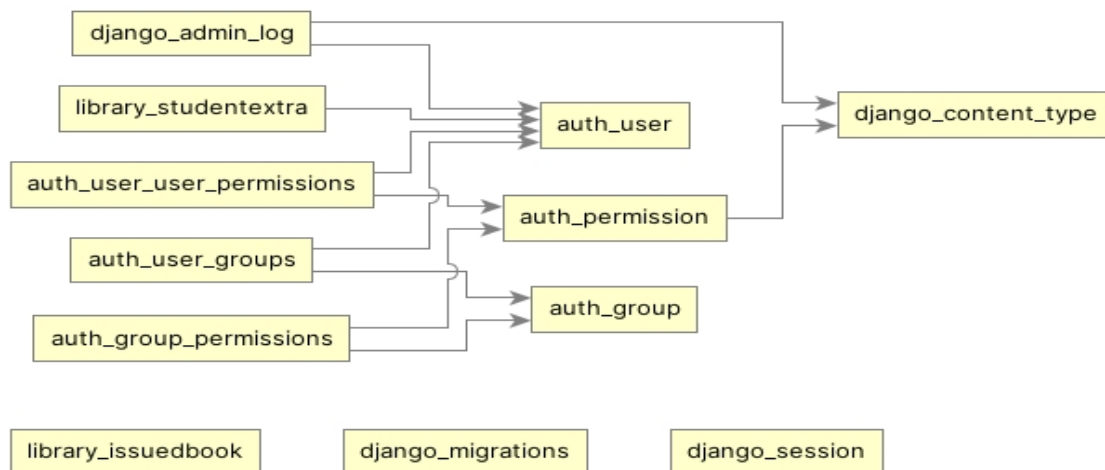
Foreign Key - columns that reference the primary key of another table.

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 be 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.

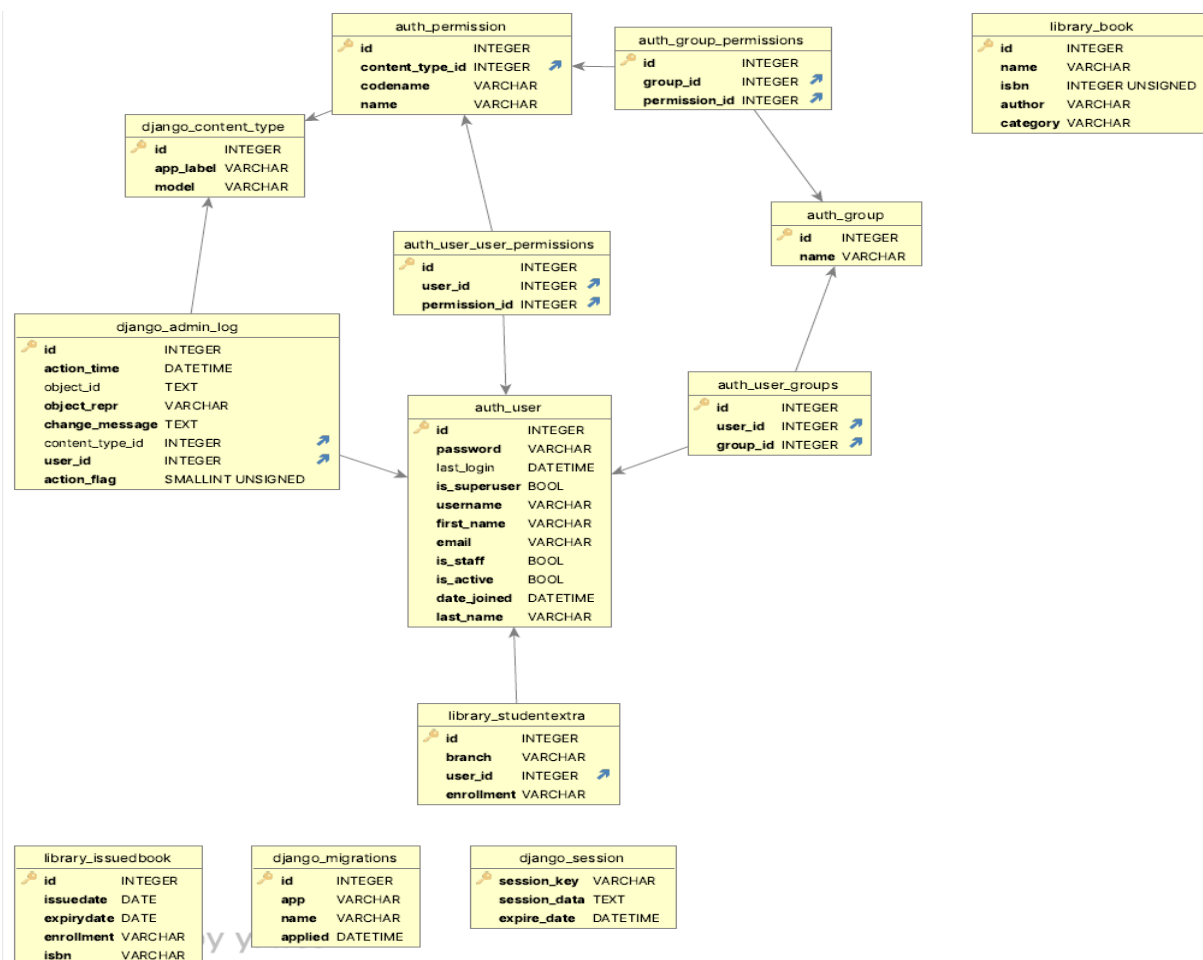
Auth_user – It has different data type for different attributes. It is an entity consisting of user login details to the application. It is used to define the user characteristics like first name, last name, join date, email, password, user state, and user permission level.

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.

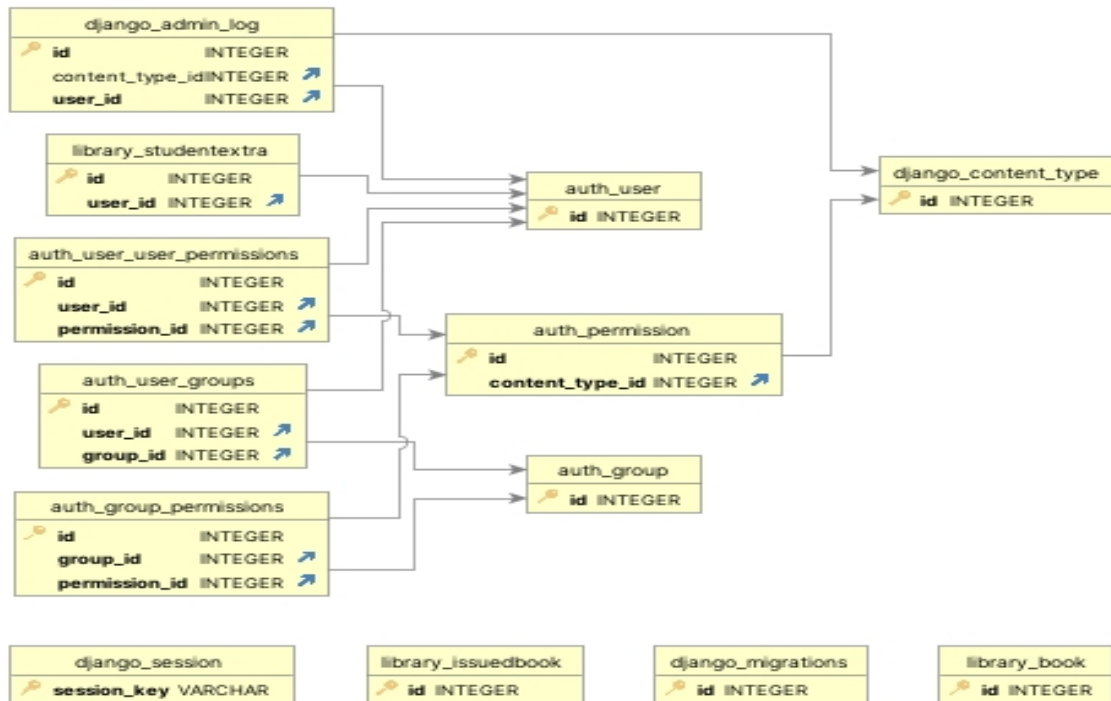
Library_issuedbook – It is of VARCHAR and DATE data type carrying the information about book issuance details.

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



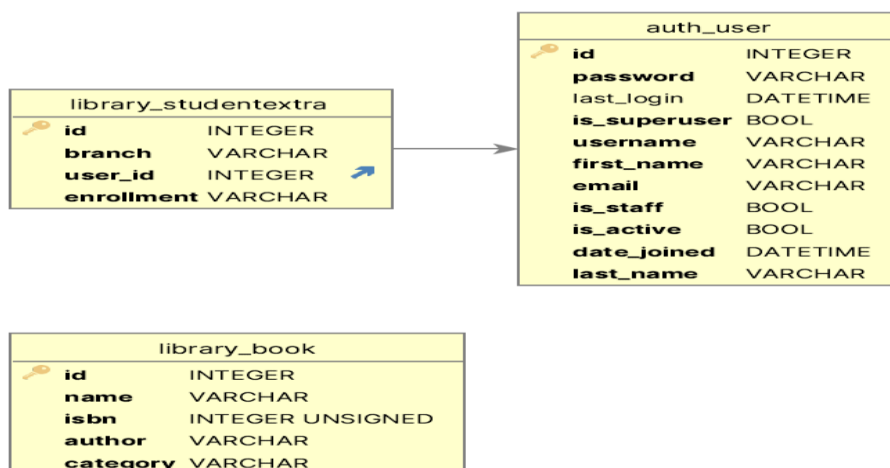
1.3 Primary Keys:

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

Table:

Columns

Primary Key

Foreign Keys

Unique Constraints

Check Constraints

Constraint Name	Condition
	"action_flag" >= 0

Table:	library_book			
Columns	Primary Key	Foreign Keys	Unique Constraints	Check Constraints
Constraint Name			Condition	
			"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						
Columns	Primary Key	Foreign Keys	Unique Constraints	Check Constraints		
Name			Size	Scale	Nullable	Def
id			INTEGER	0	<input type="checkbox"/>	
action_time			DATETIME	0	<input type="checkbox"/>	
object_id			TEXT	0	<input checked="" type="checkbox"/>	
object_repr			VARCHAR	0	<input type="checkbox"/>	
change_message			TEXT	0	<input type="checkbox"/>	
content_type_id			INTEGER	0	<input checked="" type="checkbox"/>	
user_id			INTEGER	0	<input type="checkbox"/>	
action_flag			SMALLINT UNSIGNED	0	<input type="checkbox"/>	

Table: auth_user					
Columns	Primary Key	Foreign Keys	Unique Constraints	Check Constraints	
Name			Size	Scale	Nullable
id			INTEGER	0	<input type="checkbox"/>
password			VARCHAR	0	<input type="checkbox"/>
last_login			DATETIME	0	<input checked="" type="checkbox"/>
is_superuser			BOOL	0	<input type="checkbox"/>
username			VARCHAR	0	<input type="checkbox"/>
first_name			VARCHAR	0	<input type="checkbox"/>
email			VARCHAR	0	<input type="checkbox"/>
is_staff			BOOL	0	<input type="checkbox"/>
is_active			BOOL	0	<input type="checkbox"/>
date_joined			DATETIME	0	<input type="checkbox"/>
last_name			VARCHAR	0	<input type="checkbox"/>

Unique Constraint

Table

auth_group
auth_user
library_studentextra

Constraint

name
username
user_id

Table:		auth_group	
Columns	Primary Key	Foreign Keys	Unique Constraints
Check Constraints			
Constraints			
Constraint Name		Columns	
		name	
Constraint Columns			
Column		Include	

Table:

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

Auth_group_permission
Auth_permission
Auth_user_groups
Auth_user_user_permissions
Django_admin_log
Library_studentextra

Constraints

group_id , permission_id
content_type_id
user_id , group_id
user_id , permission_id
content_type_id , user_id
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		

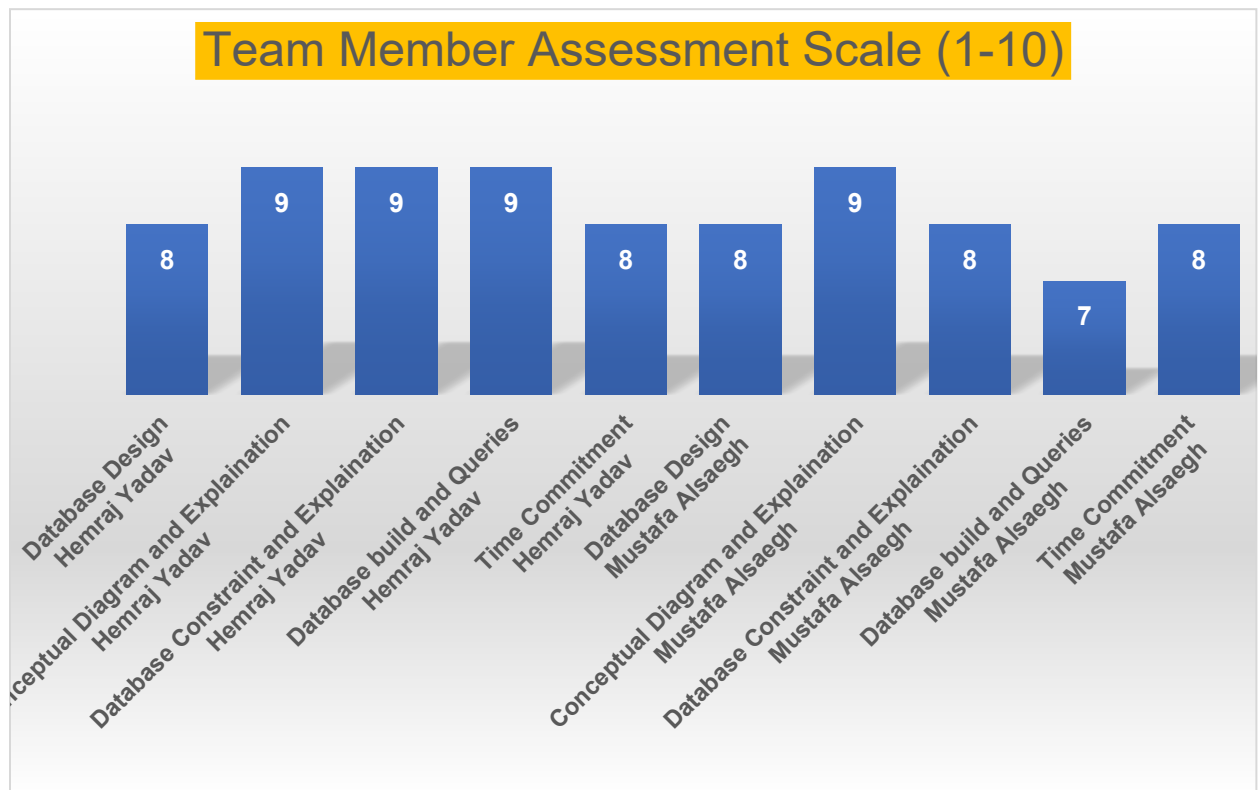
Table:	django_admin_log			
	Columns	Primary Key	Foreign Keys	Unique Constraints Check Constraints
Constraints				
	Constraint Name	Columns	On Delete Action	On Update Action
		content_type_id		
		user_id		

Table:	library_studentextra			
Columns	Primary Key	Foreign Keys	Unique Constraints	Check Constraints
Constraints				
Constraint Name	Columns	On Delete Action	On Update Action	
	user_id			

3. Build Database and Queries

See attached PDF file *SQL_Code.pdf* on Canvas

4. Team Member Assessment



Hemraj: We still do have opportunity to improve time commitment, database code and conceptual schema.

Mustafa: I think we managed time effectively and completed the tasks within the given time frame. Our Conceptual Schema identifies all the necessary entities and their relationships, but as for our database it does need optimization, using appropriate indexing, partitioning, and clustering techniques. The code is functions good, data insertion and retrieval operations working as expected, but there is space for improving.