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BSCpE-2A2

Laboratory Activity No. 2:

Topic belongs to: **Software Design and Database Systems**

Title: *Designing the Database Schema for the Library Management System*

Introduction: In this activity, you will design the database schema for the Library Management System. The database will include tables for books, authors, users, and borrowing records. You will also learn how to use Django's ORM (Object-Relational Mapping) to define the models.

Objectives:

- Design the database schema for the Library Management System.
- Create Django models to represent the schema.
- Use Django's ORM to interact with the database.

Theory and Detailed Discussion: Django uses an ORM (Object-Relational Mapping) system to map Python objects to database tables. By defining models in Python code, Django automatically creates the corresponding database tables. We will start by designing the database schema with the necessary relationships between entities like books, authors, and users.

Materials, Software, and Libraries:

- **Django** framework
- **SQLite** database (default in Django)

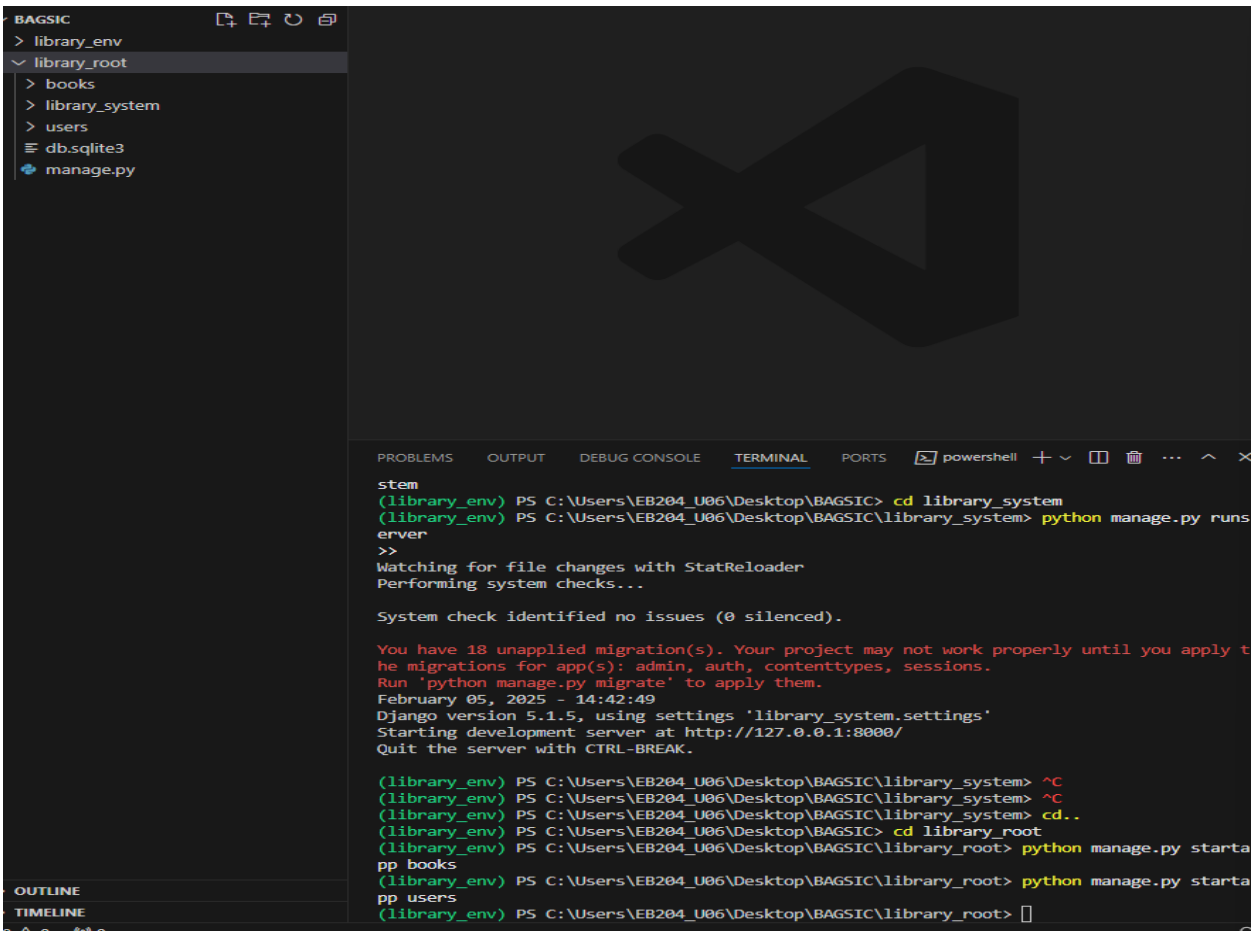
Time Frame: 2 Hours

Procedure:

1. **Create Django Apps**:
    - In Django, an app is a module that handles a specific functionality. To keep things modular, we will create two apps: one for managing books and another for managing users.

python manage.py startapp books

python manage.py startapp users



2. **Define Models for the Books App**:
    - Open the books/models.py file and define the following models:

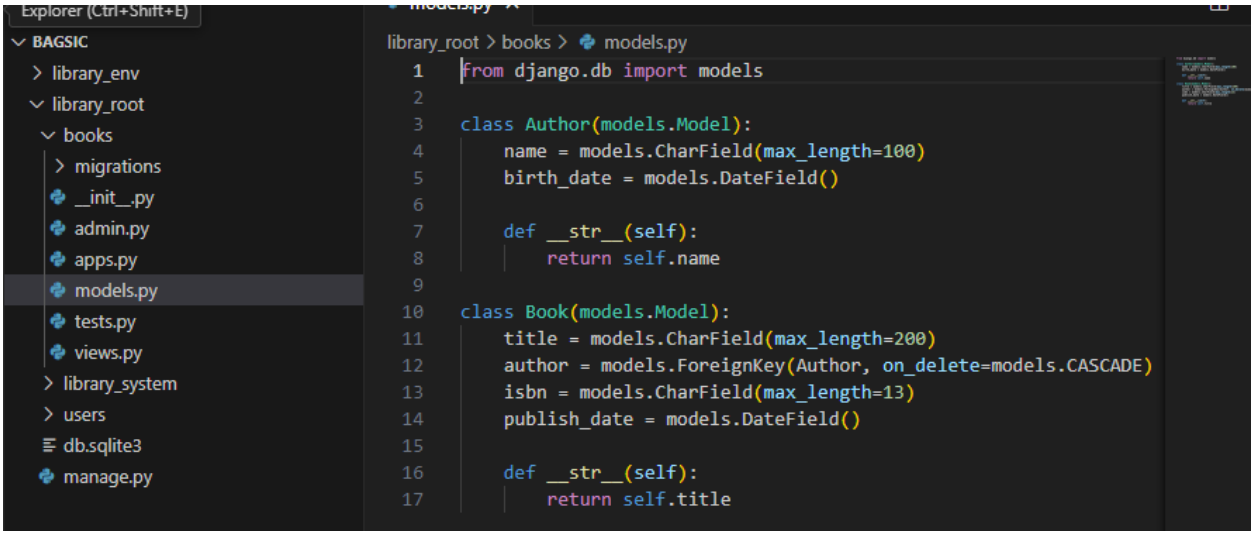
from django.db import models

```
class Author(models.Model):
    name = models.CharField(max_length=100)
    birth_date = models.DateField()

    def __str__(self):
        return self.name

class Book(models.Model):
    title = models.CharField(max_length=200)
    author = models.ForeignKey(Author, on_delete=models.CASCADE)
    isbn = models.CharField(max_length=13)
    publish_date = models.DateField()

    def __str__(self):
        return self.title
```



3. **Define Models for the Users App**:
    - Open the users/models.py file and define the following models:

```
from django.db import models
from books.models import Book

class User(models.Model):
    username = models.CharField(max_length=100)
    email = models.EmailField()

    def __str__(self):
        return self.username

class BorrowRecord(models.Model):
    user = models.ForeignKey(User, on_delete=models.CASCADE)
    book = models.ForeignKey(Book, on_delete=models.CASCADE)
    borrow_date = models.DateField()
    return_date = models.DateField(null=True, blank=True)
```

4. **Apply Migrations**:
    - To create the database tables based on the models, run the following commands:

```
python manage.py makemigrations
```

```
46      'django.contrib.sessions.middleware.SessionMiddleware',
47      'django.middleware.common.CommonMiddleware',
48      'django.middleware.csrf.CsrfViewMiddleware',
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell

```
(library_env) PS C:\Users\EB204_U06\Desktop\BAGSIC\library_root> python manage.py makemigrations
No changes detected
(library_env) PS C:\Users\EB204_U06\Desktop\BAGSIC\library_root> python manage.py makemigrations
Migrations for 'books':
  books\migrations\0001_initial.py
    + Create model Author
    + Create model Book
Migrations for 'users':
  users\migrations\0001_initial.py
    + Create model User
    + Create model BorrowRecord
```

python manage.py migrate

```
48      'django.middleware.csrf.CsrfViewMiddleware',
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS powershell

```
    + Create model User
    + Create model BorrowRecord
(library_env) PS C:\Users\EB204_U06\Desktop\BAGSIC\library_root> python manage.py migrate
Operations to perform:
  Apply all migrations: admin, auth, books, contenttypes, sessions, users
Running migrations:
  Applying contenttypes.0001_initial... OK
  Applying auth.0001_initial... OK
  Applying admin.0001_initial... OK
  Applying admin.0002_logentry_remove_auto_add... OK
  Applying admin.0003_logentry_add_action_flag_choices... OK
  Applying contenttypes.0002_remove_content_type_name... OK
  Applying auth.0002_alter_permission_name_max_length... OK
  Applying auth.0003_alter_user_email_max_length... OK
  Applying auth.0004_alter_user_username_opts... OK
  Applying auth.0005_alter_user_last_login_null... OK
  Applying auth.0006_require_contenttypes_0002... OK
  Applying auth.0007_alter_validators_add_error_messages... OK
  Applying auth.0008_alter_user_username_max_length... OK
  Applying auth.0009_alter_user_last_name_max_length... OK
  Applying auth.0010_alter_group_name_max_length... OK
  Applying auth.0011_update_proxy_permissions... OK
  Applying auth.0012_alter_user_first_name_max_length... OK
  Applying books.0001_initial... OK
  Applying sessions.0001_initial... OK
  Applying users.0001_initial... OK
(library_env) PS C:\Users\EB204_U06\Desktop\BAGSIC\library_root>
```

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5. **Create Superuser for Admin Panel**:
    - Create a superuser to access the Django admin panel:

python manage.py createsuperuser

```
  Applying books.0001_initial... OK
  Applying sessions.0001_initial... OK
  Applying users.0001_initial... OK                    python manage.py create
superuserenv) PS C:\Users\EB204_U06\Desktop\BAGSIC\library_root>
Username (leave blank to use 'eb204_u06'): ann
Email address: ann@gmail.com
Password:
Password (again):
Superuser created successfully.
(library_env) PS C:\Users\EB204_U06\Desktop\BAGSIC\library_root>
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```

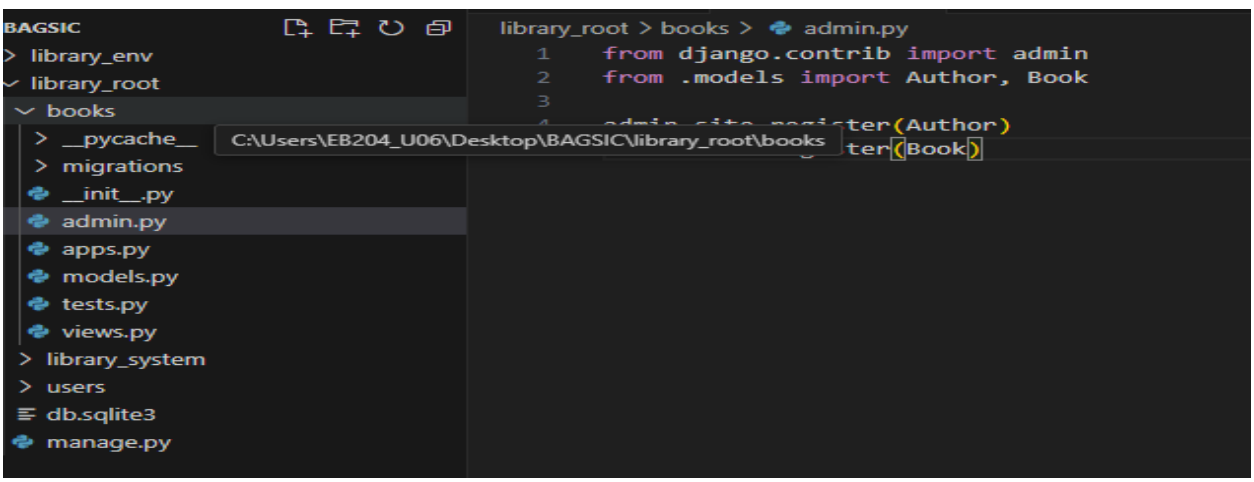
6. **Register Models in Admin Panel**:
    - In books/admin.py, register the Author and Book models:

from django.contrib import admin

from .models import Author, Book

admin.site.register(Author)

admin.site.register(Book)



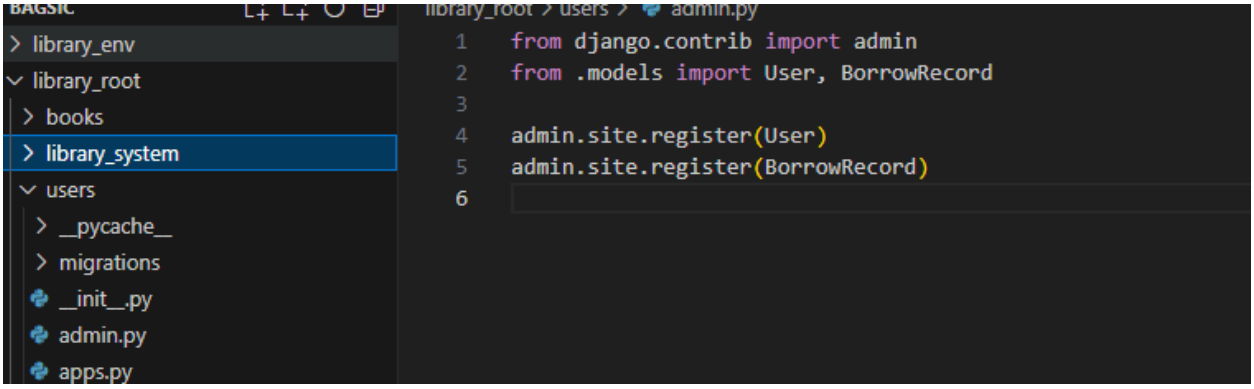
- In users/admin.py, register the User and BorrowRecord models:

from django.contrib import admin

from .models import User, BorrowRecord

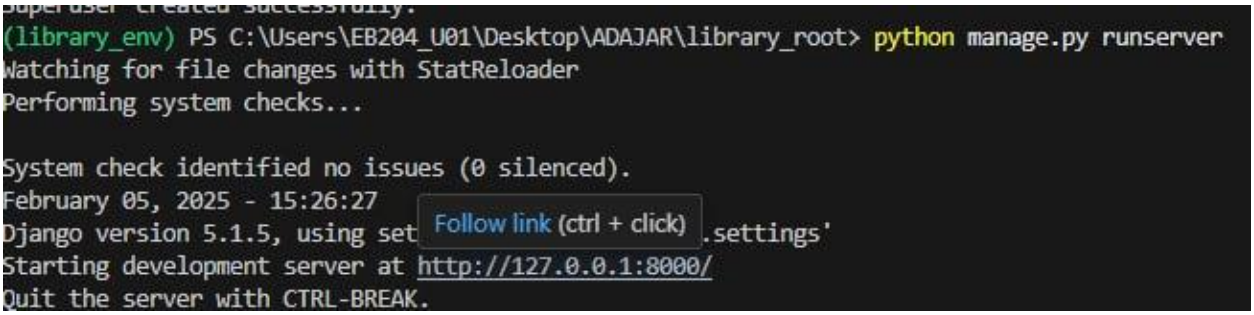
admin.site.register(User)

admin.site.register(BorrowRecord)



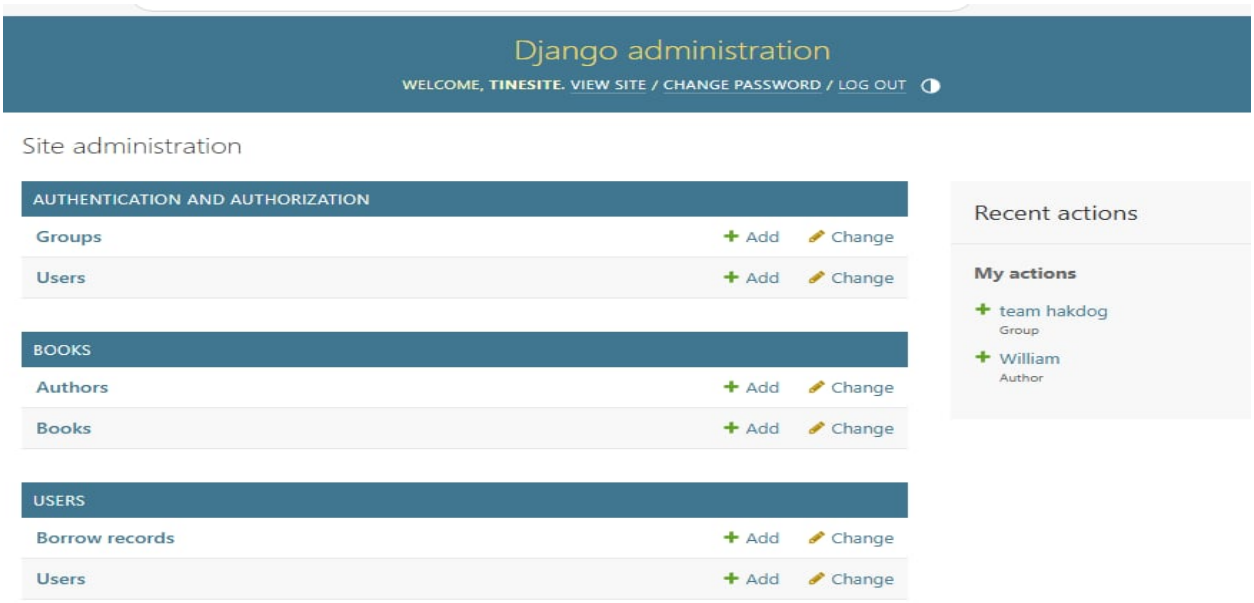
7. **Run the Development Server**:
    - Start the server again to access the Django admin panel:

python manage.py runserver



8. **Access Admin Panel**:

- Go to http://127.0.0.1:8000/admin and log in using the superuser credentials. You should see the Author, Book, User, and BorrowRecord models.



Django Program or Code: Write down the summary of the code for models that has been provided in this activity.

Results: By the end of this activity, you will have successfully defined the database schema using Django models, created the corresponding database tables, and registered the models in the admin panel. (print screen the result and provide the github link of your work)

Follow-Up Questions:

1. What is the purpose of using Foreign Key in Django models?

Ans. A Foreign Key in Django models is used to create a relationship between two models. It links one model to another, allowing you to store references to records in another table. This helps maintain data integrity and makes it easier to manage related data.

1. How does Django's ORM simplify database interaction?

Ans. Django's ORM (Object-Relational Mapping) simplifies database interaction by allowing developers to work with databases using Python code instead of SQL. It automatically translates Python objects to database tables and vice versa, so you can perform operations like creating, reading, updating, and deleting records using Python methods without writing raw SQL queries. This makes database management faster and more intuitive.

Findings:

The database schema for the Library Management System was successfully designed using Django models. Relationships between books, authors, users, and borrowing records were established using Foreign Keys. The models were migrated to create database tables, and they were successfully registered in the Django admin panel.

Summary:

This activity focused on designing and implementing a database schema using Django's ORM. Models for books, authors, users, and borrowing records were created, and migrations were applied to generate the corresponding database tables. The admin panel was set up for easy management of records.

Conclusion:

The activity was successful in setting up a structured database using Django's ORM. This approach simplifies database interactions and ensures efficient data management for the Library Management System.