(Module 9)

Python DB and Framework

HTML in Python

Theory: •

Introduction to embedding HTML within Python using web frameworks like Django or Flask.

• Generating dynamic HTML content using Django templates.

ANS **1. Introduction to Embedding HTML Within Python**

Web frameworks like **Django** and **Flask** allow developers to connect Python programs with HTML pages.
Instead of creating only static HTML files, these frameworks provide a **template system** that makes it possible to generate HTML dynamically.
In this approach:

- Python handles the backend logic such as processing data, interacting with databases, and controlling the overall flow.
- HTML is used for the structure and presentation of the web page.
- A template engine acts as the link between Python and HTML.

This technique helps in building websites where the content changes based on user actions, database values, or server-side calculations.

Generating Dynamic HTML Content Using Django Templates

Django uses a powerful **template engine** that allows developers to insert dynamic content into HTML pages.
The template system provides special syntax for:

- Displaying variables sent from Python

- Performing simple logic like loops and conditions
- Reusing common page sections such as headers and footers

Django templates separate the design (HTML) from the application logic (Python).
The backend prepares data and passes it to the template, and the template displays that data in the browser.
This allows web pages to update automatically based on the dynamic data provided by the server.

2. CSS in Python

Theory:

• Integrating CSS with Django templates.

• How to serve static files (like CSS, JavaScript) in Django.

Ans 1

Integrating CSS with Django templates involves connecting the visual design of a website with the structure provided by HTML templates. Django follows the concept of **static files**, which include CSS, JavaScript, and images. These files do not change dynamically and are used to style and format the appearance of web pages.

Django provides a **static file management system** that allows developers to store CSS files in a designated “static” directory. Templates can then load these files using Django’s template tags. This separation ensures that the website’s design (CSS) is kept independent from the backend logic (Python) and the content structure (HTML).

When a Django template is rendered, the HTML page references the CSS files from the static directory. The browser then downloads and applies the CSS, controlling layout, colors, fonts, spacing, and overall

presentation. This method allows developers to maintain clean, organized templates and ensures consistent styling across multiple pages.

Ans 2

Django uses a dedicated system to manage and deliver static files such as CSS, JavaScript, and images. These files are essential for the appearance and behavior of a website but do not change dynamically. Because of this, Django treats them differently from templates and database-driven content.

Django introduces the concept of a **static directory**, where all static resources are stored. Each app can have its own static folder, and there may also be a central static directory for project-wide files. Django's template engine uses the **static template tag** to reference these files, making it easy to include them in HTML pages.

During development, Django automatically serves static files using its built-in development server. However, in production, static files must be collected into a single location using Django's **collectstatic** command and then served by a dedicated web server (such as Nginx or Apache). This ensures efficient loading, caching, and performance.

The static file system therefore provides a structured and scalable way to organize and deliver CSS, JavaScript, and media files across the entire Django project.

3. JavaScript with Python

Theory:

- Using JavaScript for client-side interactivity in Django templates.
- Linking external or internal JavaScript files in Django.

Ans 1

JavaScript plays an important role in adding **client-side interactivity** to Django-based websites. While Django handles server-side logic using Python, JavaScript operates directly in the browser, allowing pages to respond instantly without needing to reload.

In Django templates, JavaScript is included just like in any normal HTML page. Django's template system generates the HTML structure, and JavaScript enhances it by enabling dynamic features such as form validation, animations, content updates, user interactions, and AJAX requests. This helps create a smoother and more responsive user experience.

JavaScript interacts with elements that appear in the Django template, allowing actions like showing/hiding sections, validating user input, updating content on the page, or communicating with the server in the background. Django simply provides the data and structure, while JavaScript handles the real-time behavior in the browser.

Overall, JavaScript works alongside Django templates to blend server-side processing with fast, interactive client-side functionality.

Ans 2

In Django, JavaScript files are treated as **static files**, similar to CSS and images. Django provides a dedicated static file system to manage these resources in an organized and efficient way. When adding JavaScript to a Django project, developers can either write scripts directly inside the HTML template (internal JavaScript) or place them in separate .js files (external JavaScript).

Internal JavaScript is included within the template itself and is used for small, page-specific functions. External JavaScript files, on the other hand, are stored inside Django's **static directory** so they can be reused across multiple pages. Django's template system loads these

files using the static file mechanism, allowing them to be referenced easily inside HTML templates.

This separation ensures that JavaScript files remain clean, maintainable, and scalable. During development, Django automatically serves these static JavaScript files through the built-in server. In production, they are collected and served efficiently by a web server for faster performance. Thus, Django provides a structured system for linking both internal and external JavaScript files in a seamless manner.

4. Django Introduction

Theory:

- Overview of Django: Web development framework.
- Advantages of Django (e.g., scalability, security).
- Django vs. Flask comparison: Which to choose and why.

Ans 1

Django is a high-level, open-source **web development framework** written in Python. It is designed to help developers build secure, scalable, and maintainable web applications quickly. Django follows the **Model–View–Template (MVT)** architectural pattern, which separates data management, business logic, and the user interface. This separation makes code cleaner and easier to maintain.

Django comes with many built-in features such as an ORM for database handling, an admin panel for managing data, form handling, authentication, and strong security tools. These built-in components reduce the amount of code developers need to write, allowing them to focus on the actual functionality of the application. Django also encourages reusable code and follows the principle of **“Don’t Repeat Yourself (DRY)”**.

Because of its efficiency, security, and organized structure, Django is widely used for developing dynamic websites, e-commerce platforms, social networks, and large-scale web applications. It provides everything needed to create a complete web application from backend logic to user interface integration.

Ans 2

Django offers several important advantages that make it one of the most popular frameworks for web development. One major benefit is its **scalability**. Django is designed to handle high levels of traffic and large amounts of data, making it suitable for growing applications and large-scale platforms. Its structure allows developers to expand features or manage heavy loads without sacrificing performance.

Another key advantage is **security**. Django includes built-in protections against common web threats such as SQL injection, cross-site scripting, cross-site request forgery, and clickjacking. The framework handles many security tasks automatically, helping developers create safer applications with less effort.

Django also promotes **rapid development** through its built-in tools, reusable components, and clear project structure. Features like the ORM, admin panel, authentication system, and template engine reduce the need to write repetitive code. Additionally, Django follows the **DRY (Don't Repeat Yourself)** principle, ensuring cleaner and more maintainable code.

Finally, Django benefits from a strong **community**, extensive documentation, and a large ecosystem of reusable packages. This support makes development faster and easier, while ensuring long-term reliability.

Ans 3

Django and Flask are two popular Python web frameworks, but they differ in structure, complexity, and usage. Django is a **full-stack**

framework, meaning it provides almost everything needed to build a complete web application, including an ORM, authentication system, admin panel, and built-in security features. It follows a defined project structure and follows the **MVT architecture**, making it suitable for large, complex, and scalable applications.

Flask, on the other hand, is a **microframework**. It provides the basic tools required to build a web application but leaves most decisions—such as database choice, authentication, and file handling—up to the developer. This makes Flask extremely flexible and lightweight, ideal for small to medium applications or projects where full control and customization are important.

Which to choose and why

- **Choose Django** when you need a feature-rich, secure, and scalable system with built-in tools. It is ideal for e-commerce platforms, social media sites, dashboards, and applications that require rapid development with a structured approach.
- **Choose Flask** when you want simplicity, flexibility, and control over components. It is suitable for microservices, APIs, prototypes, or applications where the developer wants to decide every part of the stack.

In summary, Django is preferred for large, structured projects, while Flask is preferred for lightweight, customizable applications.

5. Virtual Environment

Theory:

• Understanding the importance of a virtual environment in Python projects.

• Using venv or virtualenv to create isolated environments.

Ans 1

A virtual environment is an isolated workspace that allows a Python project to have its own independent set of packages and dependencies. It ensures that different projects do not interfere with each other, even if they require different versions of libraries or Python itself. This isolation helps maintain stability and prevents conflicts that could arise when multiple projects share the same system-wide packages.

Virtual environments are important because they make projects **more organized, portable, and reliable**. They allow developers to install only the required packages for each project, keeping the environment lightweight and easy to manage. This approach also makes it easier to reproduce the same setup on another system, which is especially useful when deploying applications or collaborating with others.

Overall, virtual environments help developers maintain clean, manageable, and conflict-free Python projects, ensuring consistent and predictable behavior across different development and production systems.

Ans 2

Python provides tools like **venv** and **virtualenv** to create isolated environments for individual projects. These tools allow developers to set up a separate workspace where each project can maintain its own versions of Python packages, independent from the system-level installation. This helps avoid conflicts between libraries required by different projects.

venv is the built-in module available in modern versions of Python. It creates lightweight virtual environments that include a private directory for Python executables and installed packages. This helps ensure that each project has a controlled and consistent environment.

virtualenv is an older but more feature-rich external tool that offers additional flexibility and works with both older and newer Python versions. It allows faster environment creation and provides compatibility features that some developers prefer.

Both tools serve the same purpose: they help maintain **clean, isolated, and conflict-free development environments**, making projects more stable, portable, and easier to manage across different systems.

6. Project and App Creation

Theory:

- Steps to create a Django project and individual apps within the project.
- Understanding the role of manage.py, urls.py, and views.py.

Ans 1

Creating a Django project involves setting up the main framework structure that will hold all configurations, settings, and applications. A Django **project** acts as the overall container, while **apps** are modular components within the project that handle specific features or functionalities. Django encourages breaking a large application into smaller apps so each part is organized and reusable.

The general process begins by using Django's command-line tools to create the project structure. This generates important files such as settings, URLs, and the main project configuration. Once the project is created, individual **apps** are added inside it. Each app contains its own models, views, templates, and URLs, allowing different features (like login, products, or contact forms) to be developed independently.

After creating an app, it must be **registered** in the project's settings so Django can recognize and use it. Developers then define models,

views, and templates inside each app according to the needs of the project. This step-by-step process ensures that the application is well-structured, scalable, and easy to maintain. Django's project–app architecture allows clean separation of logic, better organization, and the ability to reuse components across different projects.

Ans 2

1. manage.py

manage.py is the central command-line utility for a Django project.
It acts as a **project manager** that helps developers run various Django commands.
Through this file, you can start the development server, create apps, apply migrations, interact with the database, and perform administrative tasks.
In simple terms, it provides a direct interface to Django's internal tools, allowing smooth project management and development.

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2. urls.py

urls.py controls the **routing system** of a Django project.
Its main role is to map specific URL paths to the appropriate functions or views that will handle them.
It acts like a **traffic controller**, deciding what code should run when a user visits a particular URL.
Django projects can have multiple urls.py files — one at the project level and others inside each app, helping maintain clean and organized routing.

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3. views.py

views.py contains the **logic that runs when a user requests a page**.
A view processes the request, performs the necessary operations

(like fetching data from the database), and returns a response such as an HTML page or JSON data.
Views form the connection between the user interface and the backend logic.
They determine what content or data should be shown to the user based on the request.

7. MVT Pattern Architecture

Theory:

- Django's MVT (Model-View-Template) architecture and how it handles request-response cycles.

Ans 1

Django's MVT (Model–View–Template) Architecture and How It Handles Request–Response Cycles – Theory

Django follows the **Model–View–Template (MVT)** architecture, which divides a web application into three interconnected components. This structure helps maintain clean separation between data, logic, and presentation.

Model

The **Model** represents the data layer. It defines the structure of the database, the fields of each table, and how data is stored, retrieved, or updated. Models act as the bridge between the application and the database by handling all data-related operations.

View

The **View** contains the business logic. It receives the user's request, interacts with the model if needed, processes the information, and returns a response. Views decide what data should be sent to the template and how the application should behave for a specific request.

Template

The **Template** is the presentation layer. It defines how the data sent from the view should be displayed to the user. Templates are written using HTML mixed with Django's template tags to show dynamic content.

How Django Handles the Request–Response Cycle

1. A user sends a request to the server by visiting a URL.
2. Django checks the **urls.py** file to determine which view should handle that request.
3. The **View** processes the request. If necessary, it communicates with the **Model** to read or modify data.
4. After processing, the view sends the required data to a **Template**.
5. The **Template** generates the final HTML page using the data provided.
6. Django sends this HTML as a **response** back to the user's browser.

This structured cycle ensures that each part of the application has a clear responsibility, making development faster, more organized, and easier to maintain.

8.Django Admin Panel

Theory:

• Introduction to Django's built-in admin panel.

• Customizing the Django admin interface to manage database records.

Ans 1

Django provides a powerful **built-in admin panel** that allows developers to manage their application's data through a user-friendly web interface. This admin panel is automatically generated based on the project's models and requires very little configuration, making it one of Django's most useful features.

The admin panel serves as a **backend management system** where administrators can add, edit, delete, and view database records without writing any SQL queries. It also provides built-in authentication, search, filtering, and data-management tools. This makes it ideal for managing content, users, products, posts, or any other data that exists in the database.

To use the admin panel, models must be registered so that Django can display them in the interface. Once registered, Django automatically creates forms and management tools for each model. Because of its convenience, security, and speed, the admin panel is widely used during development and for internal management of applications.

Ans 2

Django's admin interface is highly customizable, allowing developers to control how database records are displayed, organized, and managed. While the admin panel provides automatic forms and views for each registered model, customization ensures that the interface is more efficient, user-friendly, and tailored to the project's needs.

Customization typically involves modifying how models appear in the admin dashboard. Developers can choose which fields to display in the list view, enable search and filtering options, group related fields, and control the ordering of records. These adjustments help administrators quickly access and manage important data without navigating through unnecessary details.

Further customization allows defining custom forms, adding validation rules, and creating inline editing options for related models. Developers can also enhance the interface visually by changing labels, adding help texts, or organizing fields into sections. Overall, customizing the Django admin makes database management easier, improves efficiency, and provides a more intuitive experience for users responsible for maintaining application data.

9. URL Patterns and Template Integration

Theory:

- Setting up URL patterns in urls.py for routing requests to views.
- Integrating templates with views to render dynamic HTML content.

Ans 1

In Django, the **urls.py** file is responsible for defining URL patterns that direct incoming web requests to the appropriate view functions. This process is known as **URL routing**, and it ensures that each URL in the application loads the correct logic and response.

A URL pattern acts like a rule that matches a specific path in the browser. When a user types a URL or clicks a link, Django checks the urls.py file to see which view should handle that request. Each pattern links a particular URL path to a corresponding view function or class-based view. This connection allows Django to know what code to execute for different pages of the website.

Django projects usually have two levels of URL configuration:

1. A **project-level urls.py**, which directs requests to different apps.
2. An **app-level urls.py**, which contains routing rules for that specific app's features.

This layered structure helps keep URLs organized and makes it easier to manage large applications. By clearly mapping URLs to views,

Django ensures a smooth and predictable request–response flow throughout the website.

If you want, I can also

Ans 2

In Django, templates and views work together to generate dynamic HTML pages for users. A **view** acts as the logical part of the application: it processes the request, performs calculations or database operations, and prepares the data needed for the page. A **template**, on the other hand, defines how this data should be presented visually using HTML combined with Django's template tags.

The integration happens when the view sends data to the template through a context. The view selects the appropriate template and passes the required information, and the template uses this data to display dynamic content such as user details, lists, or database records. This separation of logic (views) and presentation (templates) makes the application well-structured, easier to maintain, and more flexible.

By combining these two components, Django ensures that each user sees HTML pages that reflect real-time data and application logic, while keeping the design and backend logic independent.

10. Form Validation using JavaScript

Theory:

- Using JavaScript for front-end form validation.

Ans 1

JavaScript plays an important role in **front-end form validation**, ensuring that user input is checked directly in the browser before it is sent to the server. This type of validation helps improve user

experience by providing instant feedback, reducing unnecessary server requests, and preventing common input errors.

Front-end validation checks whether the information entered by the user meets certain rules, such as required fields being filled, email formats being correct, passwords meeting complexity standards, or numbers falling within a valid range. Since JavaScript runs on the client side, these checks happen immediately and make the form more interactive and user-friendly.

Using JavaScript for validation also helps ensure cleaner and more accurate data is submitted to the server. Although it improves efficiency, front-end validation should always be used together with server-side validation for complete security. Overall, JavaScript enhances the reliability, usability, and responsiveness of web forms.

11. Django Database Connectivity (MySQL or SQLite)

Theory:

- Connecting Django to a database (SQLite or MySQL).
- Using the Django ORM for database queries.

Ans 1

Connecting Django to a Database (SQLite or MySQL) – Theory

Django uses a database to store and manage application data such as user records, products, posts, or any structured information. The framework provides built-in support for multiple databases, with **SQLite** as the default and **MySQL** as one of the popular alternatives for larger applications.

Using SQLite

SQLite is a lightweight, file-based database that requires no separate server installation. It is automatically configured when a new Django project is created, making it ideal for beginners, small applications,

and development environments. Because it stores data in a single file, it is easy to manage and requires minimal setup.

Using MySQL

MySQL is a powerful, server-based relational database system suitable for larger projects and production environments. Connecting Django to MySQL involves configuring database settings and installing appropriate database drivers. MySQL provides better performance, scalability, and security for applications that expect high traffic or complex queries.

Django's ORM

Regardless of the database used, Django interacts with the database through its **Object–Relational Mapper (ORM)**. The ORM allows developers to work with databases using Python code instead of writing SQL directly. This provides database flexibility and makes switching between databases easier without major code changes.

Overall, Django supports smooth database integration, offering simple configuration for SQLite and scalable options like MySQL for more demanding applications.

Ans 2

Django's **Object–Relational Mapper (ORM)** is a powerful tool that allows developers to interact with the database using Python code instead of writing SQL queries. It acts as a bridge between Django models and the underlying database, automatically converting Python instructions into database operations.

The ORM enables developers to perform common database tasks such as creating, reading, updating, and deleting records using model methods. Because the ORM is integrated with Django models, every database table is represented as a Python class, and each row is treated as a Python object. This approach improves readability, reduces errors, and makes database operations more intuitive.

One of the major benefits of Django's ORM is database independence. The same Python code works across different databases like SQLite, MySQL, or PostgreSQL, without requiring major changes. It also allows advanced features such as filtering, sorting, relationships (foreign keys), and aggregation in a clean and organized way.

Overall, the Django ORM simplifies database interactions, speeds up development, and ensures that database logic remains consistent, secure, and easy to maintain.

12. ORM and QuerySets

Theory:

• Understanding Django's ORM and how QuerySets are used to interact with the database.

Ans 1

1. What is Django ORM?

ORM (Object Relational Mapping) is a feature in Django that allows developers to interact with the database using **Python code instead of SQL queries**.

- Without ORM → you write SQL manually.
- With Django ORM → you use Python objects and methods to perform database operations like *insert, update, delete, fetch*, etc.

Why Django ORM?

- No need to write raw SQL.
- Database independent (works with MySQL, PostgreSQL, SQLite, etc.).
- Secure (prevents SQL injection).

- Easier to read and maintain.

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2. What is a QuerySet?

A **QuerySet** is a collection of objects retrieved from the database using the ORM.

When you run:

User.objects.all()

It returns a **QuerySet** containing all records from the User table.

Characteristics of QuerySets

- Lazy evaluation (queries run only when needed).
- Can be filtered, sliced, or combined.
- Represent database rows as **Python objects**.

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3. Common QuerySet Methods

Fetching Data

User.objects.all() # Get all records

User.objects.get(id=1) # Get one record (throws error if not found)

User.objects.filter(city='Ahemdabad') # Get matching records

Creating Data

User.objects.create(name="Aman", email="aman@gmail.com")

Updating Data

User.objects.filter(id=1).update(name="Aman Solanki")

Deleting Data

```
User.objects.filter(id=1).delete()
```

---

4. Example: Model + QuerySet Usage

Model

```
class Student(models.Model):
    name = models.CharField(max_length=50)
    age = models.IntegerField()
```

QuerySet Examples

```
# All students
Student.objects.all()

# Students aged 20
Student.objects.filter(age=20)

# Get one student
Student.objects.get(id=5)

# Create student
Student.objects.create(name="Aman", age=22)
```

---

5. Summary

- Django ORM lets you interact with the database using Python.
- QuerySets represent a set of database rows.
- QuerySets are powerful, flexible, and safe.

- You can perform all CRUD operations without writing SQL.

13. Django Forms and Authentication

Theory:

• Using Django's built-in form handling.

• Implementing Django's authentication system (sign up, login, logout, password management).

Ans 1

Using Django's Built-in Form Handling

1. Introduction

Django provides a built-in **forms framework** that helps developers create, validate, and process HTML forms easily using Python classes instead of writing the entire HTML and handling validation manually.

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2. Django Form Classes

Forms in Django are created by defining a class that inherits from:

- **forms.Form** → for simple forms not linked to a database
- **forms.ModelForm** → for forms that directly interact with Django models

Example:

```
from django import forms


class ContactForm(forms.Form):
    name = forms.CharField()
    email = forms.EmailField()
```

---

3. Rendering Forms in Templates

Django automatically generates HTML for forms.

In views:

```
def contact(request):
    form = ContactForm()
    return render(request, 'contact.html', {'form': form})
```

In template:

```
<form method="POST">
    {% csrf_token %}
    {{ form.as_p }}
    <button type="submit">Submit</button>
</form>
```

---

4. Handling Form Submission

When the form is submitted (POST request), Django automatically validates the form.

```
def contact(request):
    if request.method == "POST":
        form = ContactForm(request.POST)
        if form.is_valid():
            name = form.cleaned_data['name']
            email = form.cleaned_data['email']
            # process data
    else:
```

```
        form = ContactForm()

    return render(request, 'contact.html', {'form': form})
```

---

5. Validation

Django handles:

- Required fields
- Data type validation
- Custom validations via clean() or clean_fieldname() methods

Example:

```
def clean_email(self):
    email = self.cleaned_data['email']
    if "gmail.com" not in email:
        raise forms.ValidationError("Email must be Gmail.")
    return email
```

---

6. Using ModelForm

ModelForm automatically creates form fields based on model fields.

```
class StudentForm(forms.ModelForm):
    class Meta:
        model = Student
        fields = ['name', 'age']
```

Usage:

```
form = StudentForm(request.POST)
```

```
if form.is_valid():
    form.save()   # creates or updates model object
```

---

7. Benefits of Django's Form Handling

- Automatic field generation
- Built-in validation
- CSRF protection
- Easy integration with templates
- Cleaner and secure code

Ans 2

1. Introduction

Django provides a powerful **built-in authentication system** that handles user registration, login, logout, password hashing, and password management securely. It saves developers from writing their own authentication logic.

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2. User Model

Django includes a default user model (django.contrib.auth.models.User) with fields like:

- Username
- Password (stored as a hashed value)
- Email
- First name, Last name

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3. Sign Up (User Registration)

For user registration, developers often use:

- Django's built-in UserCreationForm, **or**
- A custom form using User.objects.create_user()

Example process:

1. User submits signup form.
2. Django validates the data.
3. Password is hashed automatically.
4. New user is stored in the database.

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4. Login Process

Django handles login using:

- authenticate() → checks username and password
- login() → creates a session for the user

Theory:

- The user enters credentials.
- Django verifies the credentials using authentication backends.
- If valid, a session ID is stored in the browser, marking the user as logged in.
- Logged-in users can access restricted pages using login_required decorator.

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5. Logout Process

Django provides a simple logout() function that:

- Clears the session data

- Logs the user out safely
- Prevents unauthorized access to restricted pages after logout

After logout, users are usually redirected to the home or login page.

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6. Password Management

Django includes built-in tools for secure password handling:

(a) Password Hashing

- Passwords are never stored in plain text.
- Django automatically hashes passwords using strong algorithms like PBKDF2.

(b) Password Change

- Logged-in users can change their password using PasswordChangeForm.
- After changing the password, the session gets updated so the user doesn't get logged out.

(c) Password Reset (Forgot Password)

Django provides:

- Reset email link generation
- Token-based verification
- Secure reset form

Steps:

1. User submits email.
2. Django sends a secure link with a time-based token.
3. User clicks link and enters a new password.
4. Password is updated securely.

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7. Session Management

- Django uses sessions to track logged-in users.
- Cookies store only the session key, not user data.
- Session expires after logout or after a timeout.

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8. Advantages of Django's Authentication System

- Fully secure (session handling, hashing, CSRF protection)
- Easy to integrate using forms and built-in views
- Customizable (extend user model)
- Saves development time
- Prevents common security issues (SQL injection, brute-force attacks)

14. CRUD Operations using AJAX

Theory:

• Using AJAX for making asynchronous requests to the server without reloading the page.

Ans 1

Using AJAX for Making Asynchronous Requests in Django (Without Page Reloading)

1. Introduction

AJAX (Asynchronous JavaScript and XML) is a technique used to send and receive data from the server **without refreshing the entire webpage**.
In Django, AJAX is commonly used to update parts of a webpage dynamically using JavaScript or jQuery.

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2. Purpose of AJAX

- Load data from the server without reloading the page
- Improve user experience and speed
- Update only specific portions (divs, tables, forms)
- Useful for live search, form validation, likes/comments, etc.

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3. How AJAX Works (General Flow)

1. JavaScript event occurs (like button click, form submit).
2. AJAX sends a request to a Django URL using fetch() or jQuery.
3. Django view processes the request and returns JSON data or HTML.
4. JavaScript updates the page using the response.
5. No full page reload happens.

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4. AJAX Request Format

Front-end sends an asynchronous request using:

- JavaScript fetch()
- jQuery $.ajax()

The request usually expects JSON from Django.

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5. Django View for AJAX

In Django, an AJAX endpoint:

- Processes data (GET or POST)

- Returns JsonResponse instead of rendering a full template

Django provides:

from django.http import JsonResponse

A typical AJAX view returns:

- JSON data
- Small HTML block
- Status messages

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6. CSRF Handling

For POST requests, Django requires a **CSRF token**.
JavaScript must include the token in the AJAX request header.

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7. Advantages of Using AJAX in Django

- Faster interaction
- No page reload
- Better user experience
- Less bandwidth usage
- Allows real-time features like live search, auto-refresh lists

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8. Common Use Cases in Django

- Live search suggestions
- Real-time form validation
- Auto-refresh notifications
- Like/Comment systems

- Loading more posts (infinite scroll)
- Updating cart items in e-commerce websites

15. Customizing the Django Admin Panel

Theory:

• Techniques for customizing the Django admin panel.

Ans 1

1. Introduction

Django provides a powerful built-in admin panel that allows developers to manage database models.
Although it works automatically, Django also provides several techniques to **customize the admin interface** to make it more user-friendly and suitable for project requirements.

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2. Registering Models with Custom Admin Classes

Instead of using the default admin display, developers can override admin behavior by creating custom ModelAdmin classes.

Example concept:

- Define a custom class inheriting from admin.ModelAdmin
- Customize display, search, filters, and forms
- Register the model with this custom class

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3. Customizing List Display

Using list_display, developers can choose which fields appear in the admin list view.

Purpose:

- Show important fields directly
- Make record management easier

---

4. Adding Search Functionality

Admin can be made more powerful using search_fields.

Benefits:

- Search by name, email, or any important field
- Saves time in large databases

---

5. Adding Filters

list_filter adds sidebar filters that allow the admin to filter records by categories, date, or status.

Advantages:

- Quick filtering
- Useful for admin dashboards with large datasets

---

6. Customizing Forms

Admin forms can be customized using:

- fields
- fieldsets
- readonly_fields
- Custom validation logic

Uses:

- Organize fields in the admin form

- Make certain fields editable or read-only
- Add custom input rules

---

7. Inline Model Editing

Django allows editing related models directly on the parent model page using:

- StackedInline
- TabularInline

Purpose:

- Manage relationships (e.g., Order → OrderItems)
- Reduce navigation steps

---

8. Custom Admin Actions

Developers can create bulk actions that can be applied to selected records.

Examples:

- Approve selected users
- Mark orders as shipped
- Delete multiple items

---

9. Customizing Admin Look and Feel

Django allows:

- Changing admin site title, header, and index title
- Adding custom CSS/JavaScript

- Overriding admin templates for a fully custom design

Purpose:

- Branding
- Adding extra functionality
- Improving UI

---

10. Advantages of Customizing Django Admin

- Improves usability
- Makes data management faster
- Enhances clarity for non-technical staff
- Allows business-specific workflows

16. Payment Integration Using Paytm

Theory:

• Introduction to integrating payment gateways (like Paytm) in Django projects.

Ans 1

1. Introduction

A payment gateway is a service that allows websites to securely accept online payments. Popular options include **Paytm, Razorpay, Stripe, and PayPal**.
In Django projects, payment gateways are integrated to handle online transactions for e-commerce, subscriptions, bookings, etc.

---

2. Purpose of Payment Gateway Integration

- To allow users to pay using UPI, net banking, cards, or wallets

- To securely transfer payment information
- To confirm orders only after successful payment
- To automate payment tracking in the database

---

3. How Payment Gateways Work (General Flow)

1. User chooses a product and proceeds to checkout.
2. Django backend creates a payment order (amount, order ID).
3. User is redirected to the payment gateway (e.g., Paytm).
4. User completes payment on the gateway's secure page.
5. The gateway sends a **callback response** to Django.
6. Django verifies the payment using the gateway API.
7. Order is marked as **successful** or **failed** in the database.

This ensures **security and reliability**.

---

4. Paytm Integration in Django (Concept)

Integrating Paytm usually involves:

(a) Merchant Credentials

You get:

- Merchant ID
- Merchant Key
- Paytm website/app ID

These are used to authenticate your Django application.

(b) Creating an Order

Django backend creates a transaction request that includes:

- Order ID
- Customer ID
- Amount
- Callback URL

Paytm requires the request to be signed using a **checksum** for security.

(c) Redirecting to Paytm Payment Page

User is redirected to Paytm's secure payment gateway where they enter UPI/card/details.

(d) Payment Response / Callback

After payment:

- Paytm sends a POST request back to your Django callback URL.
- Django verifies the response using the checksum.

(e) Updating Payment Status

If verified:

- Mark order as *Paid*
  Else:
- Mark order as *Failed*

---

5. Security Features

Payment gateways provide:

- Encrypted transactions
- Secure redirection
- Fraud detection systems
- Checksum/Signature verification

These ensure the transaction is safe.

---

6. Advantages of Integrating a Payment Gateway

- Secure online payments
- Real-time transaction status
- Easy for customers
- Supports multiple payment methods
- Automates billing and order confirmation

---

7. Common Use Cases

- E-commerce websites
- Online booking systems
- Subscription-based services
- Donation portals
- Mobile recharges and bill payment apps

17. GitHub Project Deployment

Theory:

• Steps to push a Django project to GitHub.

Ans 1

Steps to Push a Django Project to GitHub

1. Initialize Git in the Project

To start version control, the developer first initializes Git inside the Django project folder.

Purpose:

- Track all changes
- Enable uploading to GitHub

Command:

git init

---

2. Create a .gitignore File

Before pushing the project, a .gitignore file is created to exclude unnecessary or sensitive files such as:

- __pycache__/
- db.sqlite3
- env/ or venv/
- .env (secret keys)
- migrations/ (optional)

This prevents sensitive data from being uploaded.

---

3. Add Files to Git

All project files (except ignored ones) are added to Git's staging area.

Command:

git add .

---

4. Commit the Files

A commit is created with a message describing the current project state.

Command:

git commit -m "Initial project upload"

---

5. Create a GitHub Repository

On GitHub:

- Click **New Repository**
- Enter repository name
- Keep it public or private
- Do NOT initialize with README (to avoid conflicts)

GitHub provides a remote URL for the project.

---

6. Add GitHub as Remote Repository

The remote URL links the local project with GitHub.

Command:

git remote add origin <your_repository_url>

---

7. Push the Project to GitHub

Everything is uploaded to the GitHub repository.

Command:

git push -u origin main

(Older Git versions may use master instead of main.)

---

8. Verification on GitHub

After pushing:

- Open the GitHub repository

- Confirm that all files have uploaded correctly
- Ensure .gitignore worked properly

Benefits of Using GitHub

- Cloud backup of the project
- Version control and rollback
- Easy sharing and teamwork
- Required for internships and job portfolios

18. Live Project Deployment (PythonAnywhere)

Theory:

• Introduction to deploying Django projects to live servers like PythonAnywhere.

Ans 1

1. Introduction

Deployment is the process of publishing a Django project on a live server so users can access it through the internet.
Platforms like **PythonAnywhere**, **Heroku**, **Railway**, or **AWS** are commonly used for hosting Django applications.

PythonAnywhere is especially popular for beginners because:

- It supports Python and Django natively
- It allows free hosting for small projects
- It provides simple tools for running web apps

---

2. Purpose of Deployment

- Make the Django application accessible online

- Allow users to interact with the site in real-time
- Run the website continuously, even when the developer's system is off

Deployment also ensures:

- Proper handling of static files
- Secure environment variables
- Database setup on the server

---

3. Deploying to PythonAnywhere (Concept Overview)

(a) Upload Project Files

Developers upload their Django project to PythonAnywhere using:

- GitHub
- File upload tool
- PythonAnywhere console

This places the project code on the server.

(b) Set Up Virtual Environment

A virtual environment is created on PythonAnywhere to install:

- Django
- Required Python dependencies
- Any external libraries

This ensures the hosted app runs exactly like the local environment.

(c) Install Requirements

PythonAnywhere installs all packages listed in requirements.txt.

Purpose:
To match server dependencies with the developer's system.

(d) Configure WSGI File

Django apps run using **WSGI (Web Server Gateway Interface)**.
PythonAnywhere provides a WSGI config file where:

- The project path is added
- Django settings module is specified
- Static files are configured

This file connects Django to the web server.

(e) Set Up Database

If using SQLite, the database file is uploaded.
If using MySQL or another database, connection details are configured.

(f) Collect Static Files

Django requires running:

python manage.py collectstatic

This gathers all CSS, JS, and images into a single static folder so the server can serve them properly.

(g) Reload the Web App

After configuration:

- The web app is restarted from PythonAnywhere dashboard
- The project becomes live and accessible via a public URL

---

4. Advantages of Deploying Django on PythonAnywhere

- Simple for beginners

- Free plan available
- Built-in Python and Django support
- Easy database setup
- Web-based interface (no complex server setup)
- Quick deployment using GitHub

---

5. Common Use Cases

- Hosting small Django websites
- Personal portfolios
- Student projects
- E-commerce prototypes
- Educational dashboards

19. Social Authentication

Theory:

• Setting up social login options (Google, Facebook, GitHub) in Django using OAuth2.

Ans 1

1. Introduction

Social login allows users to sign in to a Django website using their existing accounts from platforms like **Google**, **Facebook**, or **GitHub**. This is done using **OAuth2**, which is an industry-standard authorization protocol that provides secure login without sharing passwords.

Django developers commonly use libraries such as:

- **django-allauth**

- **social-auth-app-django**

These libraries simplify the entire OAuth2 workflow.

---

2. What is OAuth2?

OAuth2 is a secure authorization framework that allows third-party applications (your Django site) to request limited access to user accounts on platforms like Google or GitHub.

OAuth2 provides:

- Secure login
- Token-based authentication
- No need to store user passwords
- Access only to allowed information (email, name, etc.)

---

3. Social Login Flow (General OAuth2 Process)

1. User clicks a button like **"Login with Google"**.
2. Django redirects the user to Google/Facebook/GitHub for authentication.
3. The user logs in on the provider's secure page.
4. Provider sends an **authorization code** back to Django.
5. Django exchanges the code for an **access token**.
6. Django logs the user in and creates a user account (if not already present).

This ensures secure identity verification **without exposing user credentials**.

---

4. Using django-allauth (Concept Overview)

Most developers use **django-allauth** because it supports:

- Multiple social providers
- Email login + social login
- Account management

Basic steps:

(a) Install and Configure Packages

Django-allauth is installed and added to INSTALLED_APPS.

Purpose:
To enable social login and OAuth2 handling.

(b) Add OAuth Credentials

Each provider (Google, Facebook, GitHub) requires:

- CLIENT_ID
- CLIENT_SECRET
  These are obtained from the provider's developer console.

(c) Configure Redirect URLs

OAuth providers require an allowed redirect URI, e.g.:

https://yourwebsite.com/accounts/google/login/callback/

(d) Add Provider Settings

Django settings include provider configurations like:

- GoogleOAuth2
- FacebookOAuth2
- GitHubOAuth2

(e) Update URLs

Django-allauth automatically handles:

- Login URL
- Logout URL
- Callback URL

(f) Add Social Login Buttons

Templates include social login buttons that redirect users to the chosen provider.

---

5. Advantages of Social Login

- Faster user registration
- No need to remember passwords
- Higher login success rate
- Trusted and secure authentication
- Automatically verified email address
- Reduces fake or duplicate accounts

---

6. Common Use Cases

- E-commerce websites
- Learning platforms
- Social applications
- Portfolio websites
- Any modern web application requiring login

---

7. Popular Providers

- **Google OAuth2** (most widely used)
- **Facebook Login**
- **GitHub Login** (popular for developer-focused sites)
- **Twitter, LinkedIn** (optional)

20. Google Maps API Theory:

• Integrating Google Maps API into Django projects.

Ans 1

Integrating Google Maps API into Django Projects

1. Introduction

Google Maps API allows developers to embed interactive maps, add markers, display user locations, and use geocoding services within web applications.
In Django projects, this API is commonly used for location-based features such as store locators, delivery tracking, event locations, or mapping user data.

---

2. Purpose of Google Maps Integration

- Display dynamic maps inside Django templates
- Show specific locations using latitude and longitude
- Add markers, routes, and directions
- Fetch addresses using geocoding or reverse geocoding
- Provide interactive user experiences (zooming, dragging, clicking)

---

3. Getting a Google Maps API Key

To use Google Maps, developers must:

1. Create a Google Cloud project
2. Enable the **Maps JavaScript API**
3. Generate an **API Key**
4. Restrict API usage for security

This API key is used inside Django templates to load Google Maps.

---

4. How Google Maps API Works in Django (Concept Overview)

Google Maps is a client-side service; therefore, most integration happens in the **template** using JavaScript.

The general process:

1. Django View sends data (such as coordinates) to the template.
2. Django Template loads Google Maps using <script> tag with the API Key.
3. JavaScript initializes the map and adds markers.
4. The map is displayed inside an HTML element ( ).

---

5. Integrating Google Maps in Templates

The map is created using:

- A container (e.g., id="map")
- JavaScript function to render the map
- Google Maps API script with the API key

Django only passes the required data to the template using context variables.

---

6. Passing Dynamic Data from Django

Django can pass:

- Latitude & longitude from the database
- List of multiple locations
- User's own coordinates

JavaScript inside the template uses this data to:

- Add multiple markers
- Highlight specific points
- Render location-based information

---

7. Common Use Cases

- Store locator map
- Displaying property or hotel locations
- Delivery boy live location tracking
- Event locations
- Plotting multiple points on a map
- Using geocoding to convert address → coordinates

---

8. Advantages of Using Google Maps API

- Highly interactive and user-friendly
- Accurate location data
- Customizable markers and layers
- Supports mobile-friendly maps

- Easy integration with Django templates
- Can handle large-scale map features

---

9. Additional Map Features Developers Use

- Directions API (shows routes between locations)
- Distance Matrix API (calculates travel time/distance)
- Geocoding API (converts address to coordinates)
- Autocomplete API (suggests places while typing)