**1. Question:**

Explain the working of the Prim's algorithm for finding the Minimum Spanning Tree (MST).

**Answer:**  
Prim’s algorithm starts with any arbitrary vertex and grows the Minimum Spanning Tree (MST) by adding the nearest vertex that is not yet included. It selects the edge with the smallest weight that connects a vertex in the MST to a vertex outside of it. The process repeats until all vertices are included in the MST. The algorithm ensures that the resulting spanning tree has the minimum possible total edge weight. Prim’s algorithm works efficiently with both positive and negative edge weights, as long as the graph remains connected.

**2. Question:**

What are the key differences between TCP and UDP?

**Answer:**  
TCP (Transmission Control Protocol) is a connection-oriented protocol that ensures reliable data transmission through error checking, acknowledgments, and retransmission of lost packets. It is commonly used for applications requiring data integrity, such as web browsing, email, and file transfers.

UDP (User Datagram Protocol) is a connectionless protocol that does not guarantee data delivery, ordering, or error correction. It is faster than TCP but less reliable. UDP is commonly used for real-time applications like video streaming, VoIP, and online gaming, where speed is prioritized over reliability.

**3. Question:**

Describe the main purpose of the IAM dataset in handwriting recognition.

**Answer:**  
The IAM dataset is a widely used benchmark dataset for handwriting recognition. It contains images of handwritten English text collected from multiple writers, along with corresponding transcription annotations. The dataset is used to train and evaluate Optical Character Recognition (OCR) models and handwriting recognition systems. It helps improve the performance of machine learning models in tasks such as handwritten text segmentation, word recognition, and line-level text analysis.

**4. Question:**

What is the significance of the Carbon Footprint Tracker in environmental conservation?

**Answer:**  
A Carbon Footprint Tracker helps individuals measure and monitor their greenhouse gas emissions from daily activities such as transportation, energy consumption, and food choices. By analyzing these emissions, the tracker provides insights into how users can reduce their environmental impact. It also offers suggestions, such as using public transportation, reducing electricity usage, and adopting a plant-based diet, to minimize one's carbon footprint. The tool plays a crucial role in raising awareness and promoting sustainable living practices.

**5. Question:**

Explain how Django handles user authentication in a web application.

**Answer:**  
Django provides a built-in authentication system through the django.contrib.auth module. It includes features such as user authentication, password hashing, login/logout functionalities, and session management. By default, Django securely hashes passwords using the PBKDF2 algorithm with SHA-256. The authentication system supports role-based permissions, allowing developers to define user roles and restrict access to specific parts of the application. Additionally, Django can integrate with third-party authentication providers like OAuth and OpenID for social login functionality.