Assignment 1

1. Name and describe three applications you have used that employed a database system to store and access persistent data. (e.g. airlines, online trade, banking, university system).

Online Banking

- **How it Uses Databases:** Stores customer data, transactions, and account details.
- **Reasoning:** Ensures secure, fast, and reliable access to banking information.

E-commerce (e.g. Amazon)

- **How it Uses Databases:** Manages product listings, customer orders, and payments.
- **Reasoning:** Uses a relational database to store structured data and provide recommendations.

University Management Systems

- **How it Uses Databases:** Stores student records, enrolments, and grades.
- **Reasoning:** Ensures students and faculty have real-time access to course materials and academic records.

2. Propose three applications in domain projects (e.g. criminology, economics, brain science, etc.) Be sure you include:
i. Purpose
ii. Functions
iii. Simple interface design

1. Healthcare: Patient Health Monitoring System

- Purpose: Tracks and stores patient health data, including vital signs and medical history.
- Functions: Stores patient records, lab reports, prescriptions, and doctor's notes.
- Reasoning: Helps doctors access real-time patient data and enables predictive analytics for early disease detection.

2. Agriculture: Smart Farming Analytics

- Purpose: Uses IoT devices and weather data to optimize farming practices.
- Functions: Stores soil conditions, weather forecasts, crop growth data, and fertilizer usage.
- Reasoning: Helps farmers make data-driven decisions to increase crop yields and reduce resource wastage.

3. Disaster Management: Emergency Response System

- Purpose: Manages disaster response operations and helps coordinate rescue efforts.
- Functions: Stores emergency reports affected area details, available resources, and response team locations.
- Reasoning: Ensures quick decision-making and efficient resource allocation during natural disasters.

3. If data can be retrieved efficiently and effectively, why is data mining needed?

Data mining is essential because it allows us to extract meaningful insights from large datasets beyond just retrieving stored data. Below are key reasons why data mining is needed:

1. Finding Hidden Patterns & Relationships

- Databases can retrieve data efficiently, but they don't automatically find patterns or trends.
- Example: A retail store database can retrieve past sales records, but data mining can identify which products are frequently bought together to improve marketing strategies (e.g., "Customers who buy bread often buy butter").

2. Predictive Analytics & Forecasting

- Data mining helps predict future trends based on historical data.
- Example: In healthcare, data mining can analyse patient records to predict disease outbreaks or detect early signs of illnesses based on symptoms and medical history.

3. Decision Making & Automation

- Businesses use data mining to make data-driven decisions rather than relying on intuition.
- Example: A bank database stores thousands of transactions, but data mining can detect fraudulent transactions by identifying unusual spending behaviours.

4. Reducing Complexity in Big Data

- Big data is too large and complex for traditional database queries alone. Data mining helps extract valuable insights from massive datasets.
- Example: Social media platforms use data mining to analyse user behaviour, sentiment, and engagement trends to personalize content recommendations.

5. Competitive Advantage & Business Intelligence

- Companies use data mining to gain a competitive edge by identifying market trends, customer preferences, and business risks.

- Example: E-commerce platforms like Amazon use data mining to recommend personalized products based on past purchases and browsing history.

6. Describe at least three tables that might be used to store information in a social network/social media system such as Twitter or Reddit.

Answer:

A social media platform like Twitter or Reddit would require multiple tables for structured data management. Below are three essential tables:

1. **Users Table**
    - **Stores information about users.**

    User ID, Username, Email, Password, Date Joined.
2. **Posts Table**
    - **Stores tweets or Reddit posts.**

    Post ID, User ID, Post Content, Created At, Likes Count, Comments Count.
3. **Followers Table**
    - **Stores relationships between users.**

    Follower ID, Followed ID, Date Followed.