Practice Problems

Q1. A smart parking system decides whether to open overflow parking based on:

- Parking occupancy percentage
- Day (weekday/weekend)
- Event scheduled (yes/no)
- Weather (rain reduces outdoor parking)

Design a flowchart showing how the system decides to open overflow parking.

Q2. A smart irrigation system decides watering schedules using:

- Soil moisture level
- Time of day
- Crop type (high vs low water needs)
- Weather forecast (rain/no rain)

Draw a labelled flowchart illustrating the irrigation decision process.

Q3. A security alert (S) is triggered when:

- Door is open (D) AND (motion detected (M) OR alarm armed (A))
  OR
- Door closed AND alarm armed AND it is nighttime (N)

1. Write the Boolean expression for S
2. Simplify it using Boolean algebra

Q4. A machine maintenance alert (M) activates when:

- Temperature is high (T) AND vibration detected (V)
  OR
- Temperature is moderate AND machine age > 5 years (A)

Formulate and simplify the Boolean expression.

Q5. A smart hospital system collects:

- Patient records
- Real-time heart rate sensor data
- Mobile app feedback

1. Identify what data goes into SQL vs NoSQL
2. Provide 2 SQL table examples
3. Give a sample NoSQL document

Q6. An online learning platform stores:

- Student profiles
- Course enrollments
- Clickstream activity data

Design a hybrid database solution and describe data flow.

Q7. A field survey app is developed by 4 developers and must work offline.

Describe:

- Branching strategy
- Git commands used (Refer to the Git Commands doc I have shared separately)
- How offline data is merged after reconnection

Q8. A disaster response app collects reports offline during emergencies.

Propose a Git workflow and explain how conflicts are resolved when syncing data.

(Again, refer to the doc and try to use the commands to work out the flow. In case of issues, send me a message)

Q9. A smart traffic system uses roadside IoT sensors.

Identify 3 cybersecurity risks and propose one safeguard per risk.

Q10. A smart energy grid collects real-time consumption data.

Analyze threats related to:

- Data interception
- Unauthorized access
- System downtime
  Provide one mitigation for each.

Q11. A smart retail system tracks in-store behavior. (Basically, just provide criteria for the points mentioned below).

Design an analytics dashboard including:

- 3 daily metrics
- 2 visualizations
- 1 predictive insight

Q12. A public transport authority monitors bus operations.

Propose dashboard metrics, visualizations, and predictive outputs.

Q13. Predict electricity demand for a campus.

- List 3 input features
- Select an ML algorithm and justify it

Q14. Predict student dropout risk in an online course.

Choose features and an ML model with reasoning.

Q15. Design a **smart fire detection system**.

Illustrate system architecture including:

- Sensors
- Cloud services
- Databases
- Mobile alerts

Q16. Design a smart water quality monitoring system.

Draw an architecture diagram with labelled components and data flow.