Part 1: Short Answer Questions

1. Problem Definition

Hypothetical AI Problem: Detecting fraudulent transactions in mobile money platforms.

Objectives:

- Identify suspicious transaction patterns in real time.
- Minimize financial loss caused by fraud.
- Improve user trust and platform security.

Stakeholders:

- Mobile money service providers (e.g., M-PESA, Airtel Money).
- End users/customers.

Key Performance Indicator (KPI):
Fraud Detection Precision - the percentage of correctly identified fraud cases out of all flagged transactions.

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2. Data Collection & Preprocessing

Data Sources:

- Mobile money transaction logs (amount, location, time, device ID).
- User profiles (transaction history, account type, KYC details).

Potential Bias:
Behavioral bias - users in rural areas or with irregular usage patterns may be falsely flagged due to less common transaction behaviors.

Preprocessing Steps:

- Handle missing values in user profile data.
- Normalize transaction amounts to standardize scale.
- Encode categorical variables such as transaction type and device ID using one-hot encoding.

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3. Model Development

Chosen Model:
Random Forest - robust to noise, handles high-dimensional data well,
and provides interpretable feature importance.

Data Splitting:
Split the dataset into 70% training, 15% validation, and 15% test sets.

Hyperparameters to Tune:

- n_estimators: Number of trees in the forest, affecting performance and overfitting.
- max_depth: Controls tree complexity to balance bias and variance.

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4. Evaluation & Deployment

Evaluation Metrics:

- Precision - important to reduce false positives, so genuine users aren't blocked unnecessarily.
- Recall - ensures the system catches as many actual fraudulent cases as possible.

Concept Drift:

Concept drift refers to changes in transaction patterns over time, which can reduce the model's accuracy if not addressed.

Monitoring Concept Drift:

Monitor performance metrics over time and implement periodic retraining with recent data.

Deployment Challenge:

Latency and scalability - ensuring the model processes large volumes of transactions
in real time without slowing down the system.