DATABASE MANAGEMENT SYSTEM - CSA0593

ASSIGNMENT 3

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QUESTION:

Build a database to support a crowdsourced mapping platform for collecting and updating map data.

- Design tables for locations, users, map edits, and changesets.

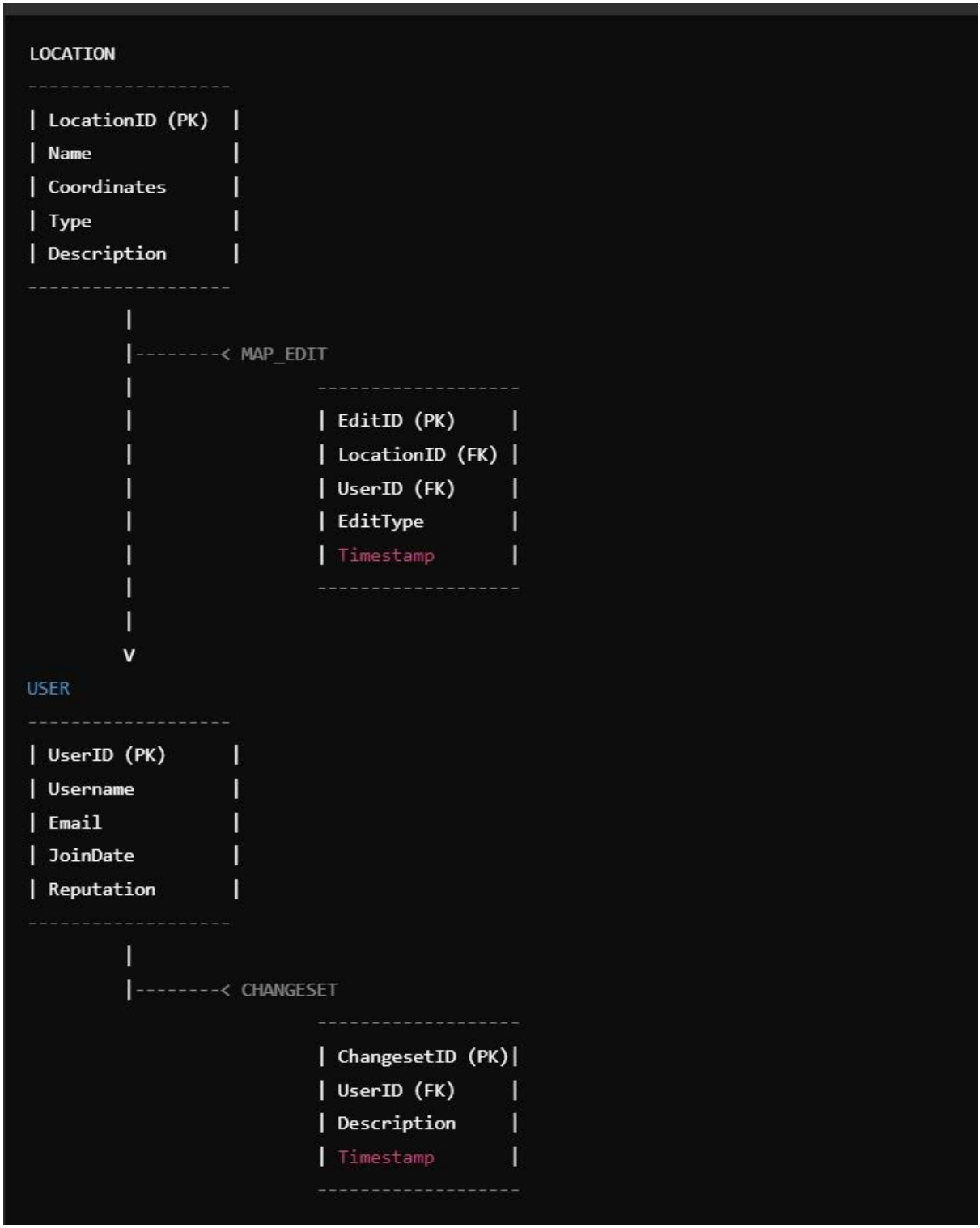
- Write queries to identify the most recent map changes and verify data accuracy.

- Implement triggers to validate user edits and prevent duplicate entries.

- Discuss indexing strategies to enable fast retrieval of data for real-time map rendering

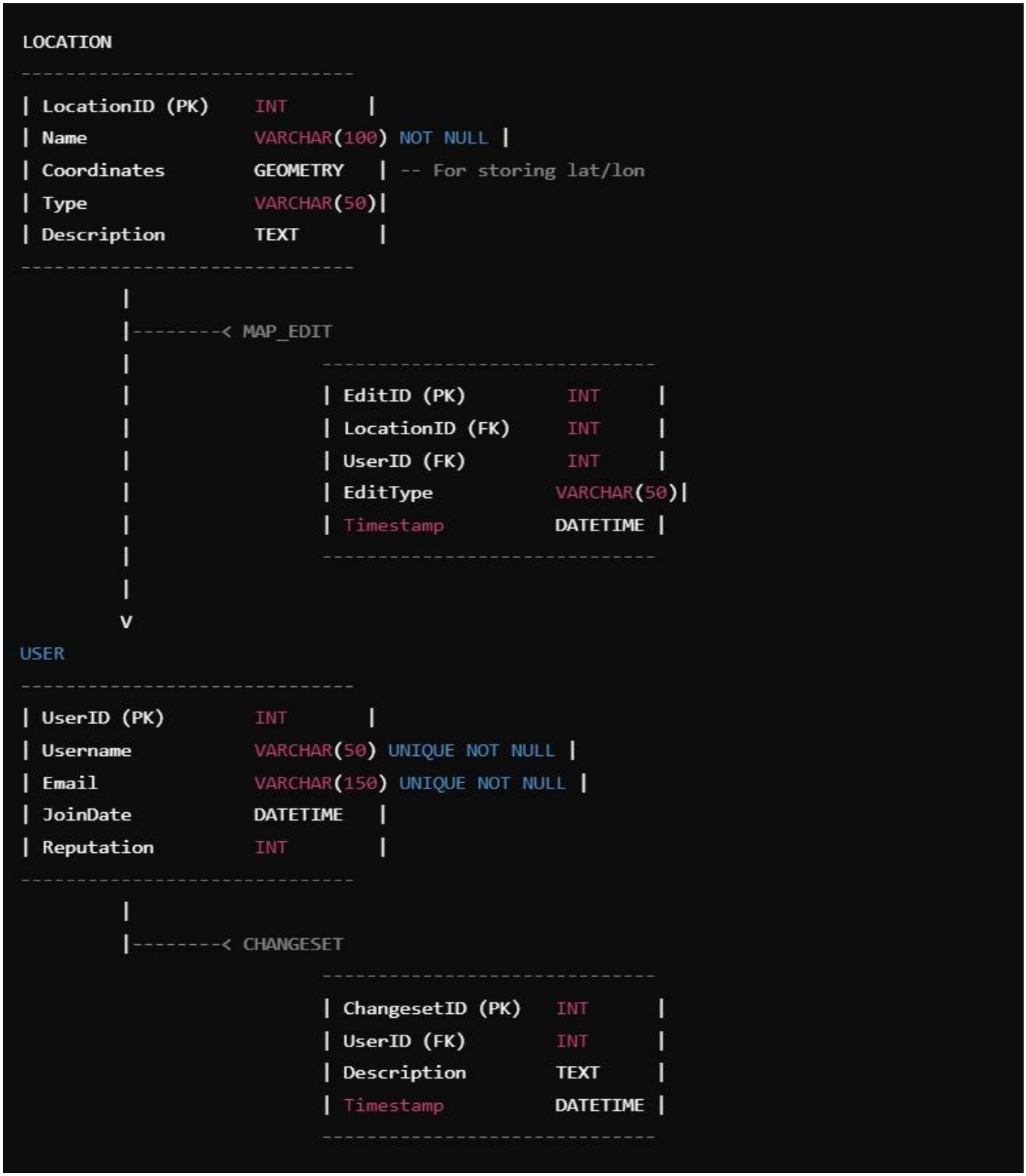
ANSWER:

CONCEPTUAL ER DIAGRAM:



LOGICAL ER DIAGRAM:

PHYSICAL ER DIAGRAM:



SQL STATEMENTS:

```
mysql
CREATE DATABASE MapData;

USE MapData;
CREATE TABLE Locations (
  LocationID INT AUTO_INCREMENT PRIMARY KEY,
  Latitude DECIMAL(10, 8),
  Longitude DECIMAL(11, 8),
  LocationName VARCHAR(100)
);

CREATE TABLE Users (
  UserID INT AUTO_INCREMENT PRIMARY KEY,
  Username VARCHAR(50),
  Email VARCHAR(100)
);
CREATE TABLE MapEdits (
  EditID INT AUTO_INCREMENT PRIMARY KEY,
  LocationID INT,
  UserID INT,
  EditDate DATETIME,
  EditType VARCHAR(50),
  FOREIGN KEY (LocationID) REFERENCES Locations(LocationID),
```

```
  FOREIGN KEY (UserID) REFERENCES Users(UserID)
);

CREATE TABLE Changesets (
  ChangesetID INT AUTO_INCREMENT PRIMARY KEY,
  EditID INT,
  ChangesetDate DATETIME,
  ChangesetDescription VARCHAR(255),
  FOREIGN KEY (EditID) REFERENCES MapEdits(EditID)
);
```

Queries:

mysql

```
-- Most Recent Map Changes
SELECT
  Locations.LocationName,
  MapEdits.EditDate,
  MapEdits.EditType
FROM
  Locations
  JOIN MapEdits ON Locations.LocationID = MapEdits.LocationID
ORDER BY
  MapEdits.EditDate DESC;

-- Verify Data Accuracy
SELECT
  Locations.LocationName,
```

```
  MapEdits.EditType,
  Changesets.ChangesetDescription
FROM
  Locations
  JOIN MapEdits ON Locations.LocationID = MapEdits.LocationID
  JOIN Changesets ON MapEdits.EditID = Changesets.EditID
WHERE
  MapEdits.EditType = 'Update';
```

Triggers:

Mysql

```
DELIMITER //

CREATE TRIGGER tr_ValidateUserEdits
BEFORE INSERT ON MapEdits
FOR EACH ROW

BEGIN
  IF NEW.EditType NOT IN ('Create', 'Update', 'Delete') THEN
    SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Invalid edit type';
  END IF;
END //

CREATE TRIGGER tr_PreventDuplicateEntries
BEFORE INSERT ON Locations
```

```
FOR EACH ROW

BEGIN
  IF EXISTS (SELECT 1 FROM Locations WHERE Latitude = NEW.Latitude AND Longitude = NEW.Longitude) THEN
    SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Duplicate location entry';
  END IF;
END //

DELIMITER;
```

Conclusion:

This database design supports a crowdsourced mapping platform by storing locations, user information, map edits, and changesets. The queries enable identification of recent map changes and verification of data accuracy. The triggers validate user edits and prevent duplicate entries. Indexing strategies optimize data retrieval for real-time map rendering.