Stored procedure code:

1:

```
DELIMITER $$

CREATE PROCEDURE Derailment_cause_rate_recent_ten_years()
BEGIN
   WITH accident AS (
      SELECT ACCIDENTS_CAUSE.CAUSE_GROUP AS Cause_Code,
           ACCIDENTS_CAUSE.ADL_CAUSE_SUBGROUP AS Cause_Name,
           COUNT(*) AS derailment
      FROM RR_ACCIDENTS
      JOIN RR_CLASS ON RR_ACCIDENTS.RAILROAD = RR_CLASS.RAILROAD
      JOIN ACCIDENTS_CAUSE ON RR_ACCIDENTS.PRICAUSE =
ACCIDENTS_CAUSE.FRA_CAUSE_CODE
      WHERE RR_CLASS.RRCLASSIFICATION = 1
        AND RR_ACCIDENTS.ACC_TYPE = 1
        AND RR_ACCIDENTS.TRAIN_TYPE = 'F'
        AND RR_ACCIDENTS.TRACK_TYPE = 'MS'
        AND YEAR(RR_ACCIDENTS.`DATE`) BETWEEN 2013 AND 2022
      GROUP BY ACCIDENTS_CAUSE.CAUSE_GROUP,
ACCIDENTS_CAUSE.ADL_CAUSE_SUBGROUP
   ),
   traffic AS (
      SELECT SUM(RR_TRAFFIC.FRTRNMI + RR_TRAFFIC.OTHERMI) AS mile
      FROM RR_TRAFFIC
      JOIN RR_CLASS ON RR_TRAFFIC.RAILROAD = RR_CLASS.RAILROAD
      WHERE RR_CLASS.RRCLASSIFICATION = 1
        AND CONCAT('20', RR_TRAFFIC.IYR) >= '2013'
        AND CONCAT('20', RR_TRAFFIC.IYR) <= '2022'
   )
   SELECT accident.Cause_Code AS Cause_Code,
        accident.Cause_Name AS Cause_Name,
        (accident.derailment / (SELECT mile FROM traffic)) * 1000000 AS derailment_rate
   FROM accident
   ORDER BY derailment_rate DESC
   LIMIT 15;
END$$

DELIMITER ;
```

2:

```
DELIMITER $$

CREATE PROCEDURE Top_15_Railroad_traffic_ten_years()
BEGIN
   SELECT
      RR_CLASS.RAILROAD_SUCCESSOR,
      RR_CLASS.RRCLASSIFICATION,
      SUM(RR_TRAFFIC.FRTRNMI) AS train_mile
   FROM
      RR_TRAFFIC
   JOIN
      RR_CLASS ON RR_TRAFFIC.RAILROAD = RR_CLASS.RAILROAD
   WHERE
      CONCAT('20', RR_TRAFFIC.IYR) >= '2013'
      AND CONCAT('20', RR_TRAFFIC.IYR) <= '2022'
   GROUP BY
      RR_CLASS.RAILROAD_SUCCESSOR, RR_CLASS.RRCLASSIFICATION
   HAVING
      RR_CLASS.RAILROAD_SUCCESSOR != ''
   ORDER BY
      train_mile DESC
   LIMIT 15;
END$$

DELIMITER ;
```

Transaction code:

```
DELIMITER $$

CREATE PROCEDURE UpdateTrafficData(
   IN p_TRAFFIC_CODE INT,
   IN p_NEW_RAILROAD VARCHAR(255),
   IN p_NEW_IYR INT,
   IN p_NEW_IMO INT
)
BEGIN
   DECLARE v_exists INT;
   DECLARE v_total_mileage DECIMAL(10,2);

   SET SESSION TRANSACTION ISOLATION LEVEL REPEATABLE READ;

   IF p_NEW_IYR < 1996 OR p_NEW_IYR > 2023 OR p_NEW_IMO < 1 OR p_NEW_IMO > 12
THEN
```

```
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Invalid year or month';
    END IF;

    START TRANSACTION;

    SELECT COUNT(*) INTO v_exists FROM RR_TRAFFIC WHERE TRAFFIC_CODE =
p_TRAFFIC_CODE;
    IF v_exists = 0 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Traffic code not found';
    END IF;

    UPDATE RR_TRAFFIC
    SET RAILROAD = p_NEW_RAILROAD, IYR = p_NEW_IYR, IMO = p_NEW_IMO
    WHERE TRAFFIC_CODE = p_TRAFFIC_CODE;

    SELECT SUM(FRTRNMI + PASTRNMI + OTHERMI) INTO v_total_mileage
    FROM RR_TRAFFIC
    WHERE TRAFFIC_CODE = p_TRAFFIC_CODE;

    UPDATE RR_TRAFFIC
    SET YSMI = v_total_mileage
    WHERE TRAFFIC_CODE = p_TRAFFIC_CODE;

    COMMIT;
END$$

DELIMITER ;
```

Example update, insert, and delete code:

Insert:

```
INSERT INTO RR_TRAFFIC (
    TRAFFIC_CODE,
    RAILROAD,
    IYR,
    IMO,
    STATE,
    COUNTY,
    YSMI,
    FRTRNMI,
    PASTRNMI,
    OTHERMI
```

```
) VALUES (
   'TC001',     -- Traffic Code
   'CN',        -- Railroad, to be changed to 'CNGT' by the trigger
   21,        -- Year
   12,          -- Month
   48,          -- State code
   'Harris',    -- County
   100,         -- Yearly Sum Miles (example)
   100000000,          -- Freight Train Miles (example)
   30,          -- Passenger Train Miles (example)
   20           -- Other Miles (example)
);

Update:
UPDATE RR_TRAFFIC
SET
   FRTRNMI = 75,    -- Updated value for Freight Train Miles
   PASTRNMI = 40,   -- Updated value for Passenger Train Miles
   OTHERMI = 25     -- Updated value for Other Miles
WHERE
   TRAFFIC_CODE = 'TC001';  -- Identifying the specific record by Traffic Code

Delete:
DELETE FROM RR_TRAFFIC
WHERE TRAFFIC_CODE = 'TC002';  -- Specify the Traffic Code of the record to delete


Other useful code:
CALL Top_15_Railroad_traffic_ten_years();
CALL Derailment_cause_rate_recent_ten_years();
SHOW CREATE PROCEDURE procedure_name;
SELECT * FROM INFORMATION_SCHEMA.TRIGGERS WHERE TRIGGER_SCHEMA =
'railroad_db';
CALL UpdateTrafficData();
SELECT * FROM RR_TRAFFIC WHERE TRAFFIC_CODE = 'TC001';
```