Tiny College - Travel Far But Slowly

Submitted By – Group 10

- ✓ **Tanya (19562)**
- ✓ **Shivani (19585)**
- ✓ **Anushaka (19595)**

- **Case Study**

The administrators of Tiny College are so pleased with your design and implementation of their student registration/tracking system that they want you to expand the design to include the database for their motor vehicle pool. A brief description of operations follows:

- Faculty members may use the vehicles owned by Tiny College for officially sanctioned travel. For example, the vehicles may be used by faculty members to travel to off-campus learning centres, to travel to locations at which research papers are presented, to transport students to officially sanctioned locations, and to travel for public service purposes. The vehicles used for such purposes are managed by Tiny College's TFBS (Travel Far But Slowly) Centre.

- Using reservation forms, each department can reserve vehicles for its faculty, who are responsible for filling out the appropriate trip completion form at the end of a trip. The reservation form includes the expected departure date, vehicle type required, destination, and name of the authorized faculty member. The faculty member arriving to pick up a vehicle must sign a checkout form to log out the vehicle and pick up a trip completion form. (The TFBS employee who releases the vehicle for use also signs the checkout form.) The faculty member's trip completion form includes the faculty member's identification code, the vehicle's identification, the odometer readings at the start and end of the trip, maintenance complaints (if any), gallons of fuel purchased (if any), and the Tiny College credit card number used to pay for the fuel. If fuel is purchased, the credit card receipt must be stapled to the trip completion form. Upon receipt of the faculty trip completion form, the faculty member's department is billed at a mileage rate based on the vehicle type (sedan, station wagon, panel truck, minivan, or minibus) used. (*Hint:* Do *not* use more entities than are necessary. Remember the difference between attributes and entities!)

- All vehicle maintenance is performed by TFBS. Each time a vehicle requires maintenance, a maintenance log entry is completed on a prenumbered maintenance log form. The maintenance log form includes the vehicle identification, a brief description of the type of maintenance required, the initial log entry date, the date on which the maintenance was completed, and the identification of the mechanic who released the vehicle back into service. (Only mechanics who have an inspection authorization may release the vehicle back into service.)

- As soon as the log form has been initiated, the log form's number is transferred to a maintenance detail form; the log form's number is also forwarded to the parts department manager, who fills out a parts usage form on which the maintenance log number is recorded. The maintenance detail form contains separate lines for each maintenance item performed, for the parts used, and for identification of the mechanic who performed the maintenance item. When all maintenance items have been completed, the maintenance detail form is stapled to the maintenance log form, the maintenance log form's completion date is filled out, and the mechanic who releases the vehicle back into service signs the form. The stapled forms are then filed, to be used later as the source for various maintenance reports.

- TFBS maintains a parts inventory, including oil, oil filters, air filters, and belts of various types. The parts inventory is checked daily to monitor parts usage and to reorder parts that reach the "minimum quantity on hand" level. To track parts usage, the parts manager requires each mechanic to sign out the parts that are used to perform each vehicle's maintenance; the parts manager records the maintenance log number under which the part is used.

- Each month TFBS issues a set of reports. The reports include the mileage driven by vehicle, by department, and by faculty members within a department. In addition, various revenue reports are generated by vehicle and department. A detailed parts usage report is also filed each month. Finally, a vehicle maintenance summary is created each month.

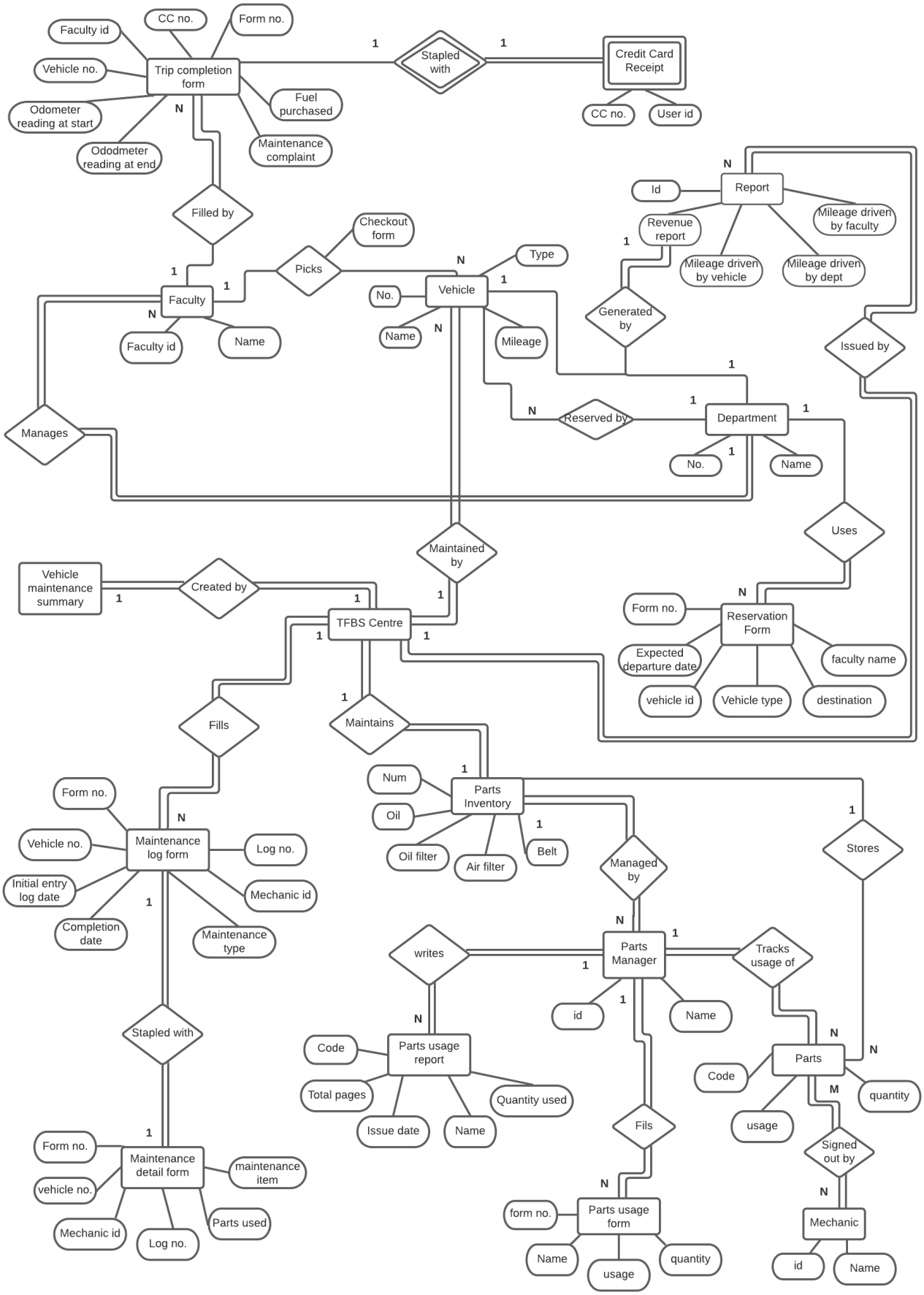
- **Entity - Relationship Diagram**

⇒ **Entity – Attributes**

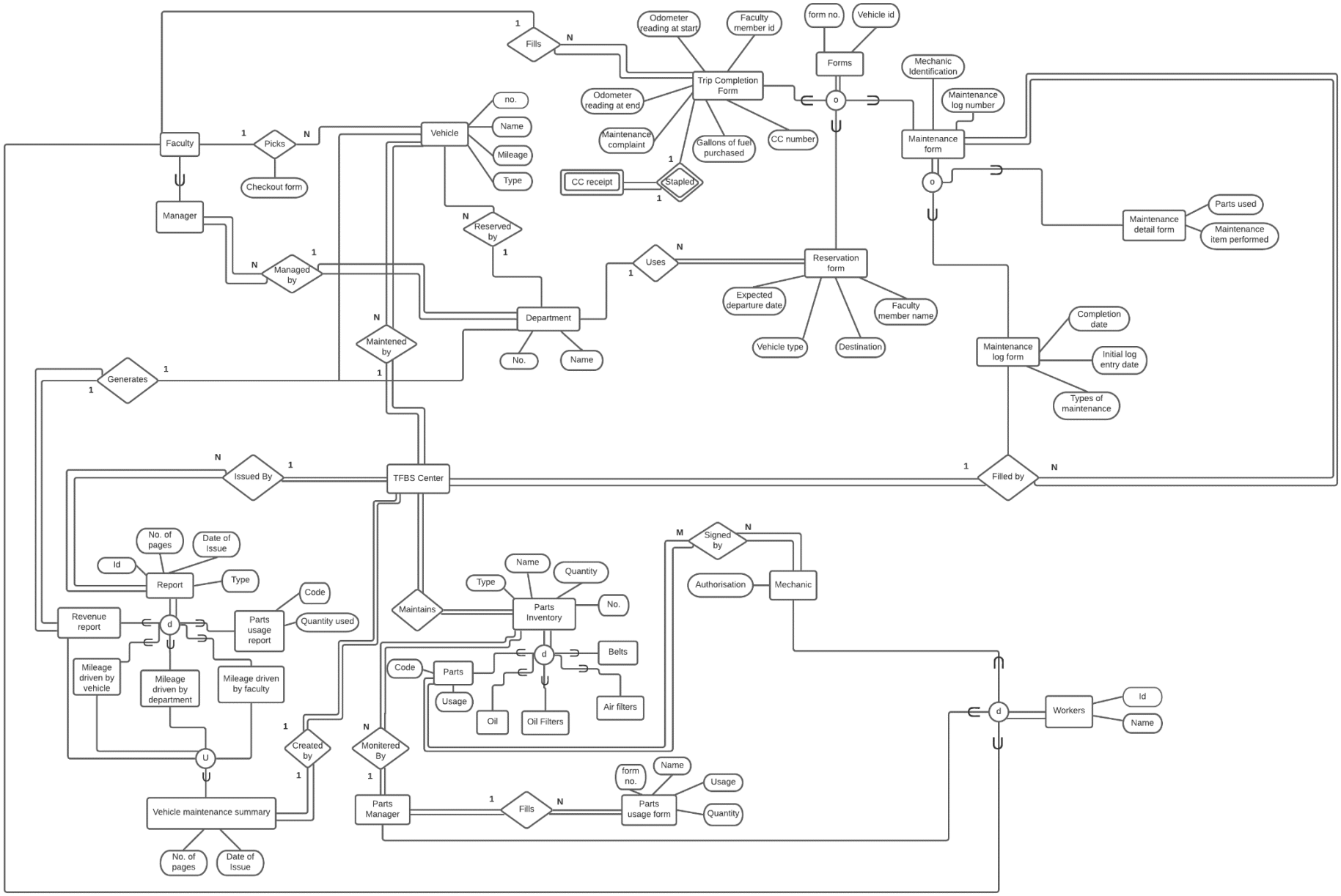
1. Report – Id, revenue report, mileage driven by vehicle, department and faculty
2. Trip completion form – faculty member id code, vehicle identification, odometer reading at start, odometer reading at end, maintenance complaint, gallons of fuel purchased, credit card number
3. Department – number, name
4. Vehicle – no., name, mileage, type
5. Credit card receipt – Credit card no., user id
6. Reservation form – vehicle id(we will assign), expected departure date, vehicle type, destination, name of authorized faculty member
7. Faculty – member id, name(Fname, Lname), department
8. Reports – Mileage driven by vehicles, mileage driven by department, mileage by faculty
9. Tfbs center – vehicle id
10. Vehicle maintenance summary
11. Maintenance log form – vehicle identification, types of maintenance, initial log entry date, completion date, mechanic identification, maintenance log number
12. Parts inventory – parts, types of belt, air filter, oil filter, oil
13. Parts manager – id, name
14. Parts usage reports – parts code, name, total pages, quantity, issue date
15. Parts usage form – form no., name, usage, quantity
16. Parts – code, usage, quantity
17. Mechanic – id, name
18. Maintenance detail form – Mechanic identification, parts used, maintenance item performed, maintenance log number, vehicle id

⇒ **Relationships**

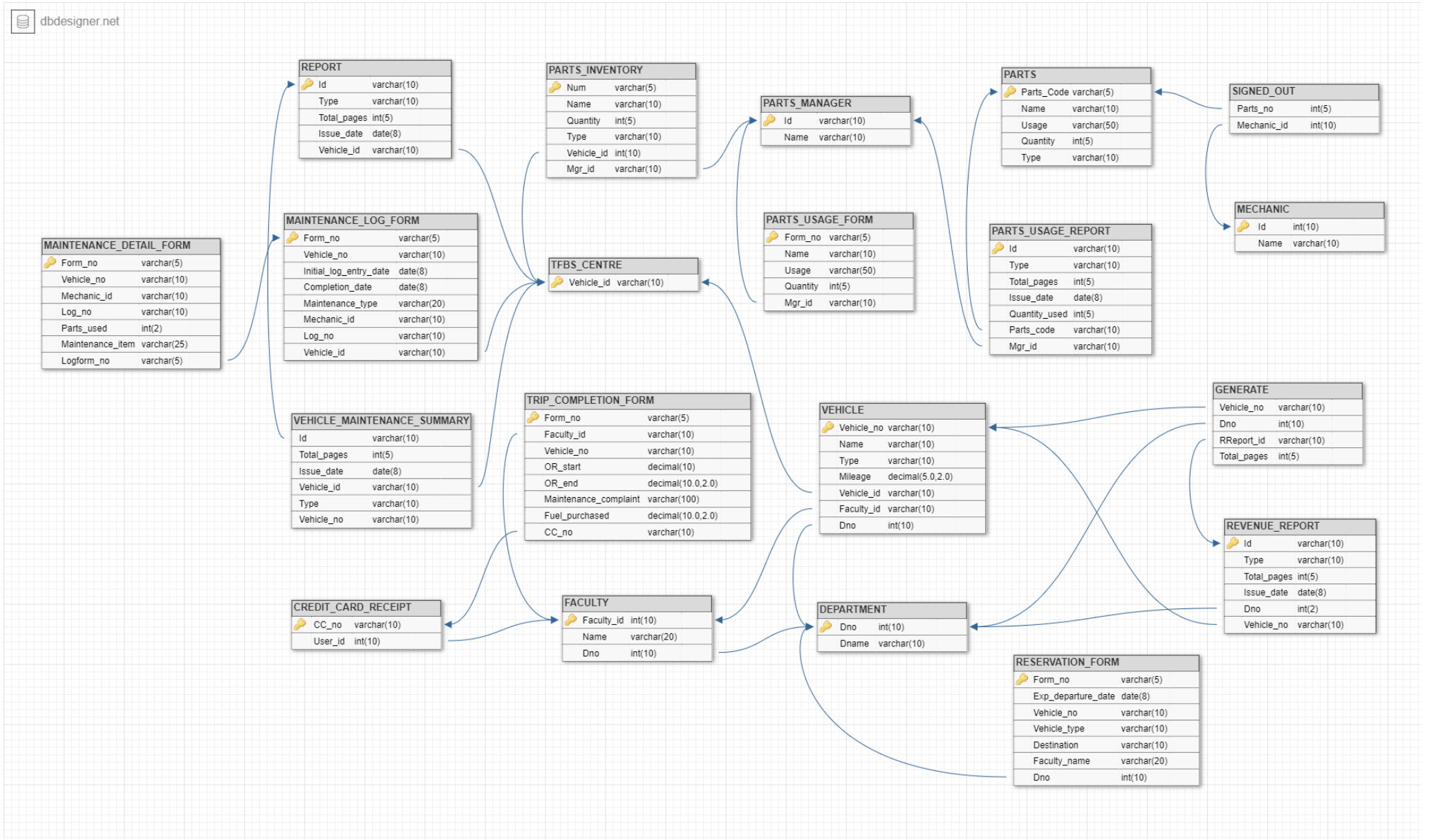
1. Credit Card Receipt is **stapled with** Trip Completion Form
2. Trip Completion Forms are **filled by** Faculty
3. Faculty **manages** Department
4. Vehicles are reserved by Department
5. Department **fills** Reservation Form
6. Faculty **picks** Vehicles
7. Vehicles are **maintained by** TFBS Centre
8. TFBS Centre **issues** Reports
9. Revenue Report is **generated by** Vehicle and Department
10. TFBS Centre **creates** Vehicle Maintenance Summary
11. TFBS Centre **fills** Maintenance Log Form
12. Maintenance Detail Form is **stapled with** Maintenance Log Form
13. TFBS Centre **maintains** Parts Inventory
14. Parts Inventory is **managed by** Parts Manager
15. Parts Inventory **stores** Parts
16. Parts are **tracked by** Parts manager
17. Parts are **signed out** by Mechanic
18. Parts Manager **fills** Parts Usage Form
19. Parts Manager **writes** Parts Usage Report


Faculty id
CC no.
Form no.
Vehicle no.
Trip completion form
Stapled with
Credit Card Receipt
Fuel purchased
Odometer reading at start
Oddometer reading at end
Maintenance complaint
CC no.
User id
Filled by
Checkout form
Picks
Type
Faculty
No.
Vehicle
Faculty id
Name
Name
Mileage
Id
Report
Revenue report
Mileage driven by faculty
Mileage driven by vehicle
Mileage driven by dept
Generated by
Issued by
Manages
Reserved by
Department
No.
Name
Maintained by
Uses
Vehicle maintenance summary
Created by
TFBS Centre
Form no.
Reservation Form
Expected departure date
faculty name
vehicle id
Vehicle type
destination
Fills
Maintains
Num
Parts Inventory
Oil
Oil filter
Air filter
Belt
Stores
Form no.
Vehicle no.
Maintenance log form
Log no.
Initial entry log date
Mechanic id
Completion date
Maintenance type
Managed by
writes
Parts Manager
Tracks usage of
id
Name
Stapled with
Code
Parts usage report
Total pages
Issue date
Name
Quantity used
Parts
Code
quantity
usage
Signed out by
Fils
Form no.
vehicle no.
Maintenance detail form
maintenance item
Mechanic id
Log no.
Parts used
form no.
Parts usage form
Name
usage
quantity
Mechanic
id
Name

- **EER Diagram**


Fills
Odometer reading at start
Faculty member id
form no.
Vehicle id
Forms
Mechanic Identification
Trip Completion Form
Odometer reading at end
Maintenance log number
Maintenance complaint
Gallons of fuel purchased
CC number
Maintenance form
Faculty
Picks
Vehicle
no.
Name
Mileage
Type
CC receipt
Stapled
Checkout form
Maintenance detail form
Parts used
Maintenance item performed
Manager
Reserved by
Managed by
Uses
Reservation form
Expected departure date
Faculty member name
Department
Maintened by
Vehicle type
Destination
No.
Name
Completion date
Initial log entry date
Maintenance log form
Types of maintenance
Generates
Issued By
TFBS Center
Filled by
No. of pages
Date of Issue
Id
Report
Type
Code
Revenue report
Parts usage report
Quantity used
Maintains
Name
Quantity
Type
Parts Inventory
No.
Signed by
Authorisation
Mechanic
Mileage driven by vehicle
Mileage driven by department
Mileage driven by faculty
Belts
Code
Parts
Usage
Oil
Oil Filters
Air filters
Workers
Id
Name
Created by
Monitered By
Vehicle maintenance summary
Parts Manager
Fills
form no.
Name
Usage
Parts usage form
Quantity
No. of pages
Date of Issue

- **Schema**


dbdesigner.net
REPORT
Id varchar(10)
Type varchar(10)
Total_pages int(5)
Issue_date date(8)
Vehicle_id varchar(10)
PARTS_INVENTORY
Num varchar(5)
Name varchar(10)
Quantity int(5)
Type varchar(10)
Vehicle_id int(10)
Mgr_id varchar(10)
PARTS_MANAGER
Id varchar(10)
Name varchar(10)
PARTS
Parts_Code varchar(5)
Name varchar(10)
Usage varchar(50)
Quantity int(5)
Type varchar(10)
SIGNED_OUT
Parts_no int(5)
Mechanic_id int(10)
MECHANIC
Id int(10)
Name varchar(10)
MAINTENANCE_DETAIL_FORM
Form_no varchar(5)
Vehicle_no varchar(10)
Mechanic_id varchar(10)
Log_no varchar(10)
Parts_used int(2)
Maintenance_item varchar(25)
Logform_no varchar(5)
MAINTENANCE_LOG_FORM
Form_no varchar(5)
Vehicle_no varchar(10)
Initial_log_entry_date date(8)
Completion_date date(8)
Maintenance_type varchar(20)
Mechanic_id varchar(10)
Log_no varchar(10)
Vehicle_id varchar(10)
TFBS_CENTRE
Vehicle_id varchar(10)
PARTS_USAGE_FORM
Form_no varchar(5)
Name varchar(10)
Usage varchar(50)
Quantity int(5)
Mgr_id varchar(10)
PARTS_USAGE_REPORT
Id varchar(10)
Type varchar(10)
Total_pages int(5)
Issue_date date(8)
Quantity_used int(5)
Parts_code varchar(10)
Mgr_id varchar(10)
VEHICLE_MAINTENANCE_SUMMARY
Id varchar(10)
Total_pages int(5)
Issue_date date(8)
Vehicle_id varchar(10)
Type varchar(10)
Vehicle_no varchar(10)
TRIP_COMPLETION_FORM
Form_no varchar(5)
Faculty_id varchar(10)
Vehicle_no varchar(10)
OR_start decimal(10)
OR_end decimal(10.0,2.0)
Maintenance_complaint varchar(100)
Fuel_purchased decimal(10.0,2.0)
CC_no varchar(10)
VEHICLE
Vehicle_no varchar(10)
Name varchar(10)
Type varchar(10)
Mileage decimal(5.0,2.0)
Vehicle_id varchar(10)
Faculty_id varchar(10)
Dno int(10)
GENERATE
Vehicle_no varchar(10)
Dno int(10)
RReport_id varchar(10)
Total_pages int(5)
REVENUE_REPORT
Id varchar(10)
Type varchar(10)
Total_pages int(5)
Issue_date date(8)
Dno int(2)
Vehicle_no varchar(10)
CREDIT_CARD_RECEIPT
CC_no varchar(10)
User_id int(10)
FACULTY
Faculty_id int(10)
Name varchar(20)
Dno int(10)
DEPARTMENT
Dno int(10)
Dname varchar(10)
RESERVATION_FORM
Form_no varchar(5)
Exp_departure_date date(8)
Vehicle_no varchar(10)
Vehicle_type varchar(10)
Destination varchar(10)
Faculty_name varchar(20)
Dno int(10)

CREATE TABLE

SQL Plus

```
SQL> CREATE TABLE REPORT (
  2  Id varchar(10) NOT NULL,
  3  Type varchar(10) NOT NULL,
  4  Total_pages int NOT NULL,
  5  Issue_date DATE NOT NULL,
  6  Vehicle_id varchar(10) NOT NULL UNIQUE,
  7  PRIMARY KEY (Id)
  8  );

Table created.

SQL> CREATE TABLE REVENUE_REPORT (
  2  Id varchar(10) NOT NULL,
  3  Type varchar(10) NOT NULL,
  4  Total_pages int NOT NULL,
  5  Issue_date DATE NOT NULL,
  6  Dno int NOT NULL,
  7  Vehicle_no varchar(10) NOT NULL,
  8  PRIMARY KEY (Id)
  9  );

Table created.

SQL> CREATE TABLE TRIP_COMPLETION_FORM (
  2  Form_no varchar(5) NOT NULL,
  3  Faculty_id varchar(10) NOT NULL,
  4  Vehicle_no varchar(10) NOT NULL,
  5  OR_start DECIMAL(10) NOT NULL,
  6  OR_end DECIMAL(10,2) NOT NULL,
  7  Maintenance_complaint varchar(100),
  8  Fuel_purchased DECIMAL(10,2),
  9  CC_no varchar(10),
 10  PRIMARY KEY (Form_no)
 11  );

Table created.

SQL> CREATE TABLE DEPARTMENT (
  2  Dno int NOT NULL,
  3  Dname varchar(10) NOT NULL,
  4  PRIMARY KEY (Dno)
  5  );

Table created.

SQL> _
```

SQL Plus

```
SQL> CREATE TABLE VEHICLE (
  2  Vehicle_no varchar(10) NOT NULL,
  3  Name varchar(10) NOT NULL,
  4  Type varchar(10) NOT NULL,
  5  Mileage DECIMAL(5,2) NOT NULL,
  6  Vehicle_id varchar(10) NOT NULL,
  7  Faculty_id varchar(10) NOT NULL,
  8  Dno int NOT NULL,
  9  PRIMARY KEY (Vehicle_no)
 10  );

Table created.

SQL> CREATE TABLE CREDIT_CARD_RECEIPT (
  2  CC_no varchar(10) NOT NULL,
  3  User_id int NOT NULL,
  4  PRIMARY KEY (CC_no)
  5  );

Table created.

SQL> CREATE TABLE RESERVATION_FORM (
  2  Form_no varchar(5) NOT NULL,
  3  Exp_departure_date DATE NOT NULL,
  4  Vehicle_no varchar(10) NOT NULL,
  5  Vehicle_type varchar(10) NOT NULL,
  6  Destination varchar(10) NOT NULL,
  7  Faculty_name varchar(20) NOT NULL,
  8  Dno int NOT NULL,
  9  PRIMARY KEY (Form_no)
 10  );

Table created.

SQL> CREATE TABLE FACULTY (
  2  Faculty_id int NOT NULL,
  3  Name varchar(20) NOT NULL,
  4  Dno int NOT NULL,
  5  PRIMARY KEY (Faculty_id)
  6  );

Table created.

SQL>
```

SQL Plus

```
SQL> CREATE TABLE MAINTENANCE_LOG_FORM (
  2  Form_no varchar(5) NOT NULL,
  3  Vehicle_no varchar(10) NOT NULL,
  4  Initial_log_entry_date DATE NOT NULL,
  5  Completion_date DATE NOT NULL,
  6  Maintenance_type varchar(20) NOT NULL,
  7  Mechanic_id varchar(10) NOT NULL,
  8  Log_no varchar(10) NOT NULL,
  9  Vehicle_id varchar(10) NOT NULL,
 10  PRIMARY KEY (Form_no)
 11  );

Table created.

SQL> CREATE TABLE MAINTENANCE_DETAIL_FORM (
  2  Form_no varchar(5) NOT NULL,
  3  Vehicle_no varchar(10) NOT NULL,
  4  Mechanic_id varchar(10) NOT NULL,
  5  Log_no varchar(10) NOT NULL,
  6  Parts_used int NOT NULL,
  7  Maintenance_item varchar(25) NOT NULL,
  8  Logform_no varchar(5) NOT NULL,
  9  PRIMARY KEY (Form_no)
 10  );

Table created.

SQL> CREATE TABLE PARTS_INVENTORY (
  2  Num varchar(5) NOT NULL,
  3  Name varchar(10) NOT NULL,
  4  Quantity int NOT NULL,
  5  Type varchar(10) NOT NULL,
  6  Vehicle_id int NOT NULL,
  7  Mgr_id varchar(10) NOT NULL,
  8  PRIMARY KEY (Num)
  9  );

Table created.

SQL> CREATE TABLE PARTS (
  2  Parts_Code varchar(5) NOT NULL,
  3  Name varchar(10) NOT NULL,
  4  Usage varchar(50) NOT NULL,
  5  Quantity int(5) NOT NULL,
  6  Type varchar(10) NOT NULL,
  7  PRIMARY KEY (Parts_Code)
  8  );
Quantity int(5) NOT NULL,
           *
```

SQL Plus

```
SQL> CREATE TABLE PARTS (
  2  Parts_Code varchar(5) NOT NULL,
  3  Name varchar(10) NOT NULL,
  4  Usage varchar(50) NOT NULL,
  5  Quantity int NOT NULL,
  6  Type varchar(10) NOT NULL,
  7  PRIMARY KEY (Parts_Code)
  8  );

Table created.

SQL> CREATE TABLE PARTS_MANAGER (
  2  Id varchar(10) NOT NULL,
  3  Name varchar(10) NOT NULL,
  4  PRIMARY KEY (Id)
  5  );

Table created.

SQL> CREATE TABLE MECHANIC (
  2  Id int NOT NULL,
  3  Name varchar(10) NOT NULL,
  4  PRIMARY KEY (Id)
  5  );

Table created.

SQL> CREATE TABLE PARTS_USAGE_FORM (
  2  Form_no varchar(5) NOT NULL,
  3  Name varchar(10) NOT NULL,
  4  Usage varchar(50) NOT NULL,
  5  Quantity int NOT NULL,
  6  Mgr_id varchar(10) NOT NULL,
  7  PRIMARY KEY (Form_no)
  8  );

Table created.

SQL> CREATE TABLE TFBS_CENTRE (
  2  Vehicle_id varchar(10) NOT NULL,
  3  PRIMARY KEY (Vehicle_id)
  4  );

Table created.

SQL>
```

SQL Plus

```
SQL> CREATE TABLE PARTS_USAGE_REPORT (
  2  Id varchar(10) NOT NULL,
  3  Type varchar(10) NOT NULL,
  4  Total_pages int NOT NULL,
  5  Issue_date DATE NOT NULL,
  6  Quantity_used int NOT NULL,
  7  Parts_code varchar(10) NOT NULL,
  8  Mgr_id varchar(10) NOT NULL,
  9  PRIMARY KEY (Id)
 10  );

Table created.

SQL> CREATE TABLE TFBS_CENTRE (
  2  Vehicle_id varchar(10) NOT NULL,
  3  PRIMARY KEY (Vehicle_id)
  4  );
CREATE TABLE TFBS_CENTRE (
             *
ERROR at line 1:
ORA-00955: name is already used by an existing object


SQL> CREATE TABLE SIGNED_OUT (
  2  Parts_no int NOT NULL,
  3  Mechanic_id varchar(10) NOT NULL
  4  );

Table created.

SQL> CREATE TABLE GENERATE (
  2  Vehicle_no varchar(10) NOT NULL,
  3  Dno int NOT NULL,
  4  RReport_id varchar(10) NOT NULL,
  5  Total_pages int NOT NULL
  6  );

Table created.

SQL> CREATE TABLE VEHICLE_MAINTENANCE_SUMMARY (
  2  Id varchar(10) NOT NULL,
  3  Total_pages int NOT NULL,
  4  Issue_date DATE NOT NULL,
  5  Vehicle_id varchar(10) NOT NULL,
  6  Type varchar(10) NOT NULL,
  7  Vehicle_no varchar(10) NOT NULL
  8  );

Table created.
```

CONSTRAINTS

```
SQL Plus
SQL> ALTER TABLE REPORT ADD CONSTRAINT REPORT_fk0 FOREIGN KEY (Vehicle_id) REFERENCES TFBS_CENTRE(Vehicle_id);

Table altered.

SQL> ALTER TABLE REVENUE_REPORT ADD CONSTRAINT REVENUE_REPORT_fk0 FOREIGN KEY (Dno) REFERENCES DEPARTMENT(Dno);

Table altered.

SQL> ALTER TABLE REVENUE_REPORT ADD CONSTRAINT REVENUE_REPORT_fk1 FOREIGN KEY (Vehicle_no) REFERENCES VEHICLE(Vehicle_no);

Table altered.

SQL>
SQL> ALTER TABLE TRIP_COMPLETION_FORM ADD CONSTRAINT TRIP_COMPLETION_FORM_fk0 FOREIGN KEY (Faculty_id) REFERENCES FACULTY(Faculty_id);

Table altered.

SQL> ALTER TABLE TRIP_COMPLETION_FORM ADD CONSTRAINT TRIP_COMPLETION_FORM_fk1 FOREIGN KEY (CC_no) REFERENCES CREDIT_CARD_RECEIPT(CC_no);

Table altered.

SQL> ALTER TABLE VEHICLE ADD CONSTRAINT VEHICLE_fk0 FOREIGN KEY (Vehicle_id) REFERENCES TFBS_CENTRE(Vehicle_id);

Table altered.

SQL> ALTER TABLE VEHICLE ADD CONSTRAINT VEHICLE_fk1 FOREIGN KEY (Faculty_id) REFERENCES FACULTY(Faculty_id);

Table altered.

SQL> ALTER TABLE VEHICLE ADD CONSTRAINT VEHICLE_fk2 FOREIGN KEY (Dno) REFERENCES DEPARTMENT(Dno);

Table altered.

SQL> ALTER TABLE CREDIT_CARD_RECEIPT ADD CONSTRAINT CREDIT_CARD_RECEIPT_fk0 FOREIGN KEY (User_id) REFERENCES FACULTY(Faculty_id);

Table altered.

SQL> ALTER TABLE RESERVATION_FORM ADD CONSTRAINT RESERVATION_FORM_fk0 FOREIGN KEY (Dno) REFERENCES DEPARTMENT(Dno);

Table altered.

SQL> ALTER TABLE FACULTY ADD CONSTRAINT FACULTY_fk0 FOREIGN KEY (Dno) REFERENCES DEPARTMENT(Dno);

Table altered.

SQL> ALTER TABLE MAINTENANCE_LOG_FORM ADD CONSTRAINT MAINTENANCE_LOG_FORM_fk0 FOREIGN KEY (Vehicle_id) REFERENCES TFBS_CENTRE(Vehicle_id);

Table altered.

SQL>
```

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SQL Plus

Table altered.

SQL> ALTER TABLE MAINTENANCE_DETAIL_FORM ADD CONSTRAINT MAINTENANCE_DETAIL_FORM_fk0 FOREIGN KEY (Logform_no) REFERENCES MAINTENANCE_LOG_FORM(Form_no);

Table altered.

SQL> ALTER TABLE PARTS_INVENTORY ADD CONSTRAINT PARTS_INVENTORY_fk0 FOREIGN KEY (Vehicle_id) REFERENCES TFBS_CENTRE(Vehicle_id);
ALTER TABLE PARTS_INVENTORY ADD CONSTRAINT PARTS_INVENTORY_fk0 FOREIGN KEY (Vehicle_id) REFERENCES TFBS_CENTRE(Vehicle_id)
                                                                         *
ERROR at line 1:
ORA-02267: column type incompatible with referenced column type


SQL> ALTER TABLE PARTS_INVENTORY ADD CONSTRAINT PARTS_INVENTORY_fk1 FOREIGN KEY (Mgr_id) REFERENCES PARTS_MANAGER(Id);

Table altered.

SQL> ALTER TABLE PARTS_USAGE_FORM ADD CONSTRAINT PARTS_USAGE_FORM_fk0 FOREIGN KEY (Mgr_id) REFERENCES PARTS_MANAGER(Id);

Table altered.

SQL> ALTER TABLE PARTS_USAGE_REPORT ADD CONSTRAINT PARTS_USAGE_REPORT_fk0 FOREIGN KEY (Parts_code) REFERENCES PARTS(Parts_Code);

Table altered.

SQL> ALTER TABLE PARTS_USAGE_REPORT ADD CONSTRAINT PARTS_USAGE_REPORT_fk1 FOREIGN KEY (Mgr_id) REFERENCES PARTS_MANAGER(Id);

Table altered.

SQL> ALTER TABLE SIGNED_OUT ADD CONSTRAINT SIGNED_OUT_fk0 FOREIGN KEY (Parts_no) REFERENCES PARTS(Parts_Code);

Table altered.

SQL> ALTER TABLE SIGNED_OUT ADD CONSTRAINT SIGNED_OUT_fk1 FOREIGN KEY (Mechanic_id) REFERENCES MECHANIC(Id);

Table altered.

SQL> ALTER TABLE GENERATE ADD CONSTRAINT GENERATE_fk0 FOREIGN KEY (Vehicle_no) REFERENCES VEHICLE(Vehicle_no);

Table altered.

SQL> ALTER TABLE GENERATE ADD CONSTRAINT GENERATE_fk1 FOREIGN KEY (Dno) REFERENCES DEPARTMENT(Dno);

Table altered.

SQL> ALTER TABLE GENERATE ADD CONSTRAINT GENERATE_fk2 FOREIGN KEY (RReport_id) REFERENCES REVENUE_REPORT(Id);

Table altered.
```

TABLES

```
SQL Plus
CC4        F3
CC5        F4
CC6        F5
CC7        F6
CC8        F7
CC9        F8
CC10       F8

10 rows selected.

SQL> SELECT * FROM REPORT;

ID         TYPE                                               TOTAL_PAGES ISSUE_DAT VEHICLE_ID
---------- -------------------------------------------------- ----------- --------- ----------
R01        MILEAGE DRIVEN BY VEHICLE                                   25 15-FEB-19 V3
R02        MILEAGE DRIVEN BY VEHICLE                                   24 26-APR-19 V7
R03        MILEAGE DRIVEN BY VEHICLE                                   25 30-JUN-19 V10
R04        MILEAGE DRIVEN BY DEPT.                                     29 28-NOV-19 V2
R05        MILEAGE DRIVEN BY DEPT.                                     30 21-DEC-19 V9
R06        MILEAGE DRIVEN BY DEPT.                                     32 29-FEB-20 V6
R07        MILEAGE DRIVEN FACULTY                                      15 10-JUL-20 V5
R08        MILEAGE DRIVEN FACULTY                                      16 18-OCT-20 V8
R09        MILEAGE DRIVEN FACULTY                                      16 24-FEB-21 V1

9 rows selected.

SQL> SELECT * FROM REVENUE_REPORT;

ID         TYPE       TOTAL_PAGES ISSUE_DAT        DNO VEHICLE_NO
---------- ---------- ----------- --------- ---------- ----------
R11        VEHICLE             23 15-FEB-19          2 HR23Z5460
R12        DEPARTMENT          28 26-APR-19          2 HR45C3480
R13        DEPARTMENT          45 30-JUN-19          2 HR62D6541
R14        VEHICLE             75 28-NOV-19          1 KL54C4330
R15        DEPARTMENT          26 21-DEC-19          3 GJ67D8622
R16        VEHICLE             53 29-FEB-20          1 RJ82F2478
R17        VEHICLE             37 10-JUL-20          3 UP62L4356
R18        DEPARTMENT          38 18-OCT-20          2 UK54M2277
R19        VEHICLE             25 24-FEB-21          1 GJ56F2170
R20        DEPARTMENT          46 30-APR-21          1 PJ42G6348

10 rows selected.

SQL> SELECT * FROM TRIP_COMPLETION_FORM;

FORM_ FACULTY_ID VEHICLE_NO   OR_START     OR_END
----- ---------- ---------- ---------- ----------
MAINTENANCE_COMPLAINT
----------------------------------------------------------------------------------------------------
FUEL_PURCHASED CC_NO
```

```
SQL Plus
BREAK FAILURE
         23.42 CC10


10 rows selected.

SQL> SET LINESIZE 300;
SQL> SELECT * FROM TRIP_COMPLETION_FORM;

FORM_ FACULTY_ID VEHICLE_NO   OR_START     OR_END MAINTENANCE_COMPLAINT                                                                                                FUEL_PURCHASED CC_NO
----- ---------- ---------- ---------- ---------- ---------------------------------------------------------------------------------------------------- -------------- ----------
TCF1  F1         HR23Z5460         346        567 OVERHEATING                                                                                                   24.81 CC1
TCF2  F2         HR45C3480       99734      99845 NULL                                                                                                           1.17 CC2
TCF3  F2         HR62D6541        6393       6895 OVERHEATING                                                                                                     .98 CC3
TCF4  F3         KL54C4330         739        890 NULL                                                                                                          23.43 CC4
TCF5  F4         GJ67D8622        1724       1845 BREAK FAILURE                                                                                                 11.36 CC5
TCF6  F5         RJ82F2478         947       1120 NULL                                                                                                          12.24 CC6
TCF7  F6         UP62L4356        3736       3900 NULL                                                                                                           5.42 CC7
TCF8  F7         UK54M2277       83578      83680 NULL                                                                                                           6.66 CC8
TCF9  F8         GJ56F2170         844       1002 OVERHEATING                                                                                                     8.9 CC9
TCF10 F8         PJ42G6348        9474       9488 BREAK FAILURE                                                                                                 23.42 CC10

10 rows selected.

SQL> SELECT * FROM DEPARTMENT;

       DNO DNAME
---------- ----------
         1 BSC
         2 BMS
         3 BFIA

SQL> SELECT * FROM VEHICLE;

VEHICLE_NO NAME       TYPE          MILEAGE VEHICLE_ID FACULTY_ID        DNO
---------- ---------- ---------- ---------- ---------- ---------- ----------
HR23Z5460  HONDA CITY SEDAN            17.8 V1         F1                  2
HR45C3480  HONDA CITY SEDAN            24.2 V2         F2                  2
HR62D6541  MERCEDES   WAGON            25.5 V3         F2                  2
KL54C4330  PANEL VAN  PANELTRUCK       15.4 V4         F3                  1
GJ67D8622  PANEL VAN  PANELTRUCK       15.4 V5         F4                  3
RJ82F2478  ESPACE     MINIVAN            16 V6         F5                  1
UP62L4356  MAZDA MPV  MINIVAN          17.2 V7         F6                  3
UK54M2277  MAZDA MPV  MINIVAN          17.2 V8         F7                  2
GJ56F2170  MINI BUS   MINIBUS          20.5 V9         F8                  1
PJ42G6348  TOYOTAMINI MINIBUS          20.8 V10        F8                  1

10 rows selected.
```

SQL Plus

```
SQL> SELECT * FROM CREDIT_CARD_RECEIPT;

CC_NO      USER_ID
---------- ----------
CC1        F1
CC2        F2
CC3        F2
CC4        F3
CC5        F4
CC6        F5
CC7        F6
CC8        F7
CC9        F8
CC10       F8

10 rows selected.

SQL> SELECT * FROM RESERVATION_FORM;

FORM_ EXP_DEPAR VEHICLE_NO VEHICLE_TYPE                                        DESTINATIO FACULTY_NAME               DNO
----- --------- ---------- -------------------------------------------------- ---------- -------------------- ----------
RF1   20-JAN-19 HR23Z5460  SEDAN                                              JAIPUR     REENA                         2
RF2   10-APR-19 HR45C3480  SEDAN                                              DELHI      MAHESH                        2
RF3   15-JUN-19 HR62D6541  STATION WAGON                                      KHARGARH   MAHESH                        2
RF4   09-NOV-19 KL54C4330  PANEL TRUCK                                        CHANDIGARH AASHI                         1
RF5   30-NOV-19 GJ67D8622  PANEL TRUCK                                        LUCKNOW    RUPA                          3
RF6   10-FEB-20 RJ82F2478  MINIVAN                                            HARIDWAR   VAISHALI                      1
RF7   24-JUN-20 UP62L4356  MINIVAN                                            MUMBAI     NAMITA                        3
RF8   22-JUN-20 UK54M2277  MINIVAN                                            NOIDA      FARUKA                        2
RF9   21-JAN-21 GJ56F2170  MINIBUS                                            GURGAON    RASHIKA                       1
RF10  18-APR-21 PJ42G6348  MINIBUS                                            HARDA      RASHIKA                       1

10 rows selected.

SQL> SELECT * FROM FACULTY;

FACULTY_ID NAME                      DNO
---------- -------------------- ----------
F1         REENA                         2
F2         MAHESH                        2
F3         AASHI                         1
F4         RUPA                          3
F5         VAISHALI                      1
F6         NAMITA                        3
F7         FARUKA                        2
F8         RASHIKA                       1

8 rows selected.
```

SQL Plus

```
SQL> SELECT * FROM MAINTENANCE_LOG_FORM;

FORM_ VEHICLE_NO INITIAL_L COMPLETIO MAINTENANCE_TYPE     MECHANIC_I LOG_NO     VEHICLE_ID
----- ---------- --------- --------- -------------------- ---------- ---------- ----------
LF1   HR62D6541  28-JAN-19 02-FEB-19 Tune up              M2         L1         V3
LF2   UP62L4356  16-APR-19 20-APR-19 Oil Changes          M3         L2         V7
LF3   PJ42G6348  21-JUN-19 25-JUN-19 Replacing Break Pads M1         L3         V10
LF4   HR45C3480  16-NOV-19 22-NOV-19 Tire Rotation        M2         L4         V2
LF5   GJ56F2170  05-DEC-19 11-DEC-19 Tune up              M3         L5         V9
LF6   RJ82F2478  19-FEB-20 24-FEB-20 Oil Changes          M1         L6         V6
LF7   GJ67D8622  30-JUN-20 03-JUL-20 Replacing Break Pads M2         L7         V5
LF8   UK54M2277  02-OCT-20 10-OCT-20 Tire Rotation        M3         L8         V8
LF9   HR23Z5460  31-JAN-21 05-FEB-21 Tune up              M1         L9         V1
LF10  RJ82F2478  22-APR-21 28-APR-21 Oil Changes          M2         L10        V6

10 rows selected.

SQL> SELECT * FROM MAINTENANCE_DETAIIL_FORM;
SELECT * FROM MAINTENANCE_DETAIIL_FORM
              *
ERROR at line 1:
ORA-00942: table or view does not exist


SQL> SELECT * FROM MAINTENANCE_DETAIL_FORM;

FORM_ VEHICLE_NO MECHANIC_I LOG_NO     PARTS_USED MAINTENANCE_ITEM           LOGFO
----- ---------- ---------- ---------- ---------- -------------------------- -----
MDF1  HR62D6541  M2         L1                  2 SPARK PLUG                 LF1
MDF2  UP62L4356  M3         L2                  1 OIL FILTER                 LF2
MDF3  PJ42G6348  M1         L3                  2 BREAK PADS                 LF3
MDF4  HR45C3480  M2         L4                  1 TIRE                       LF4
MDF5  GJ56F2170  M3         L5                  3 AIR FILTER                 LF5
MDF6  RJ82F2478  M1         L6                  1 OIL FILTER                 LF6
MDF7  GJ67D8622  M2         L7                  2 BREAK PADS                 LF7
MDF8  UK54M2277  M3         L8                  4 TIRE                       LF8
MDF9  HR23Z5460  M1         L9                  4 BELT                       LF9
MDF10 RJ82F2478  M2         L10                 1 OIL FILTER                 LF10

10 rows selected.

SQL> SELECT * FROM PARTS_MANAGER;

ID         NAME
---------- ----------
PM1        SUKHBIR
PM2        BALVINDER
```

SQL Plus

```
PARTS NAME                                          USAGE                                              QUANTITY TYPE
----- --------------------------------------------- -------------------------------------------------- ---------- --------------------
PI11  NGK SPARK PLUG                                FOR PETROL ENGINE                                          34 SPARK PLUG
PI12  MRF TYRE                                      MOVING                                                     24 TIRE
PI13  NISSAN BREAK PADS                             STOPPING                                                   65 BREAK PADS
PI14  SYSKA LIGHTS                                  FOR LOOKING                                                17 LIGHTS
PI15  SWARAJ SIDE MIRROR                            FOR VIEWING                                                 8 SIDE MIRROR
PI16  LUMINOUS BATTERY                              FOR NOT STOPPING                                           22 BATTERY

6 rows selected.

SQL> SELECT * FROM MECHANIC;

ID         NAME
---------- ----------
M1         NARESH
M2         MUKESH
M3         ABHISHEK

SQL> SELECT * FROM PARTS_USAGE_FORM;

FORM_ NAME                                          USAGE                                              QUANTITY MGR_ID
----- --------------------------------------------- -------------------------------------------------- ---------- ----------
PUF1  NGK SPARK PLUG                                FOR PETROL ENGINE                                           4 PM1
PUF2  MRF TYRE                                      MOVING                                                      2 PM2
PUF3  NISSAN BREAK PADS                             STOPPING                                                    1 PM2
PUF4  SYSKA LIGHTS                                  FOR LOOKING                                                 4 PM2
PUF5  SWARAJ SIDE MIRROR                            FOR VIEWING                                                 2 PM1
PUF6  LUMINOUS BATTERY                              FOR NOT STOPPING                                            1 PM1
PUF7  MRF TYRE                                      MOVING                                                      3 PM2
PUF8  NISSAN BREAK PADS                             STOPPING                                                    1 PM1
PUF9  SYSKA LIGHTS                                  FOR LOOKING                                                 2 PM1
PUF10 SWARAJ SIDE MIRROR                            FOR VIEWING                                                 1 PM2

10 rows selected.

SQL> SELECT * FROM PARTS_USAGE_REPORT;

ID         TYPE                                          TOTAL_PAGES ISSUE_DAT QUANTITY_USED PARTS_CODE MGR_ID
---------- --------------------------------------------- ----------- --------- ------------- ---------- ----------
R21        SPARK PLUG                                             21 15-FEB-19             4 PI11       PM1
R22        TIRE                                                   33 26-APR-19             2 PI12       PM2
R23        BREAK PADS                                             23 30-JUN-19             1 PI13       PM2
R24        LIGHTS                                                 43 28-NOV-19             4 PI14       PM2
R25        SIDE MIRROR                                            37 21-DEC-19             2 PI15       PM1
R26        BATTERY                                                25 29-FEB-20             1 PI16       PM1
R27        TIRE                                                   36 10-JUL-20             3 PI12       PM2
R28        BREAK PADS                                             37 18-OCT-20             1 PI13       PM2
R29        LIGHTS                                                 17 24-FEB-21             2 PI14       PM2
R30        SIDE MIRROR                                            67 30-APR-21             1 PI15       PM1
```

SQL Plus

```
SQL> SELECT * FROM TFBS_CENTRE;

VEHICLE_ID
----------
V1
V2
V3
V4
V5
V6
V7
V8
V9
V10

10 rows selected.

SQL> SELECT * FROM SIGNED_OUT;

PARTS_NO   MECHANIC_I
---------- ----------
PI11       M1
PI12       M2
PI13       M3
PI14       M3
PI15       M2
PI16       M1
PI13       M1
PI14       M2
PI15       M3
PI16       M2

10 rows selected.

SQL> SELECT * FROM GENERATE;

VEHICLE_NO        DNO RREPORT_ID TOTAL_PAGES
---------- ---------- ---------- -----------
HR23Z5460           2 R11                 23
HR45C3480           2 R12                 28
HR62D6541           2 R13                 45
KL54C4330           1 R14                 75
GJ67D8622           3 R15                 26
RJ82F2478           1 R16                 53
UP62L4356           3 R17                 37
UK54M2277           2 R18                 38
GJ56F2170           1 R19                 25
PJ42G6348           1 R20                 46
```

SQL Plus

```
PI14       M2
PI15       M3
PI16       M2

10 rows selected.

SQL> SELECT * FROM GENERATE;

VEHICLE_NO        DNO RREPORT_ID TOTAL_PAGES
---------- ---------- ---------- -----------
HR23Z5460           2 R11                23
HR45C3480           2 R12                28
HR62D6541           2 R13                45
KL54C4330           1 R14                75
GJ67D8622           3 R15                26
RJ82F2478           1 R16                53
UP62L4356           3 R17                37
UK54M2277           2 R18                38
GJ56F2170           1 R19                25
PJ42G6348           1 R20                46

10 rows selected.

SQL> SELECT * FROM VEHICLE_MAINTENANCE_SUMMARY;

ID         TOTAL_PAGES ISSUE_DAT VEHICLE_ID TYPE                                               VEHICLE_NO
---------- ----------- --------- ---------- -------------------------------------------------- ----------
R01                25 15-FEB-19 V3         MILEAGE DRIVEN BY VEHICLE                          HR62D6541
R02                23 15-FEB-19 V1         VEHICLE                                            HR23Z5460
R03                24 26-APR-19 V7         MILEAGE DRIVEN BY VEHICLE                          UP62L4356
R04                28 26-APR-19 V2         DEPARTMENT                                         HR45C3480
R05                25 30-JUN-19 V10        MILEAGE DRIVEN BY VEHICLE                          PJ42G6348
R06                45 30-JUN-19 V3         DEPARTMENT                                         HR62D6541
R07                29 28-NOV-19 V2         MILEAGE DRIVEN BY DEPT.                            HR45C3480
R08                75 28-NOV-19 V4         VEHICLE                                            KL54C4330
R09                30 21-DEC-19 V9         MILEAGE DRIVEN BY DEPT.                            GJ56F2170
R11                26 21-DEC-19 V5         DEPARTMENT                                         GJ67D8622
R12                32 29-FEB-20 V6         MILEAGE DRIVEN BY DEPT.                            RJ82F2478
R13                53 29-FEB-20 V6         VEHICLE                                            RJ82F2478
R14                15 10-JUL-20 V5         MILEADE DRIVEN FACULTY                             GJ67D8622
R15                37 10-JUL-20 V7         VEHICLE                                            UP62L4356
R16                16 18-OCT-20 V8         MILEADE DRIVEN FACULTY                             UK54M2277
R17                38 18-OCT-20 V8         DEPARTMENT                                         UK54M2277
R18                16 24-FEB-21 V1         MILEADE DRIVEN FACULTY                             HR23Z5460
R19                25 24-FEB-21 V9         VEHICLE                                            GJ56F2170
R20                46 30-APR-21 V10        DEPARTMENT                                         PJ42G6348

19 rows selected.
```

- **Queries**

  - **Tanya (19562)**

SQL

1. Names of maintenance items which have maintenance type ‘TIRE ROTATION’
   ⇒ Select Maintenance_item from Maintenance_Detail_Form MDF Natural Join Maintenance_Log_Form MLF where MLF.Maintenance_type = ‘Tire Rotation’;

2. Give the details of the vehicle with vehicle id V5
   ⇒ Select * from Vehicle where Vehicle_id = ‘V5’;

3. Give the name of the faculty member who has the 2nd letter of their name as ‘a’
   ⇒ Select Name from Faculty where Name like ‘_a%’;

4. Give the parts no. that are signed out by various mechanics group by mechanic id
   ⇒ Select Mechanic_id, Parts_no from Signed_Out group by Mechanic_id;

5. Give the name and no. of the department having more than 2 faculty members
   ⇒ Select Dno, Dname, Count(Faculty_id) from Department Natural Join Faculty group by D.Dno having Count(Faculty_id) > 2;

Relational

6. Give the CC NO. used by faculty with id F2
   ⇒ $\pi_{Cc\_no}(\sigma_{User\_id = F2}(Credit\_Card\_Receipt))$

7. Give trip completion form no. where odometer start reading is less than 1000
   ⇒ $\pi_{Form\_no}(\sigma_{OR\_start<1000}(Trip\_Completion\_Form))$

8. Give the names of the faculty member along with their department name
   ⇒ $\pi_{Name}(\sigma_{Faculty.Dno = Department.Dno}((Faculty) \times (Department)))$
   ⇒ $\pi_{Name}(Faculty \bowtie Department)$

9. Give the department no. which has highest no. of pages in its revenue report and total no. of pages
   ⇒ $\pi_{Dno, Total\_pages}(Revenue\_Report) - \pi_{RevenueReport.Dno, RevenueReport.Total\_pages}(\sigma_{RevenueReport.Total\_pages < R.Total\_pages}((Revenue\_Report) \times \rho_{R}(Revenue\_Report)))$

10. Give the credit card no.s which have been used by all the faculty members
    ⇒ $\pi_{CC\_no}(Credit\_Card\_Receipt) - (\pi_{CC\_no}((\pi_{CC\_no}(Credit\_Card\_Receipt) \times \pi_{Faculty\_id}(Faculty)) - (Credit\_Card\_Receipt)))$

- **Shivani (19585)**

SQL

1. Give the vehicle no. which are reserved by dept no. 3
   ⇒ Select Vehicle_no from Vehicle where Dno = 3;

2. Give the vehicle details with revenue report id – R15
   ⇒ Select * from Vehicle V natural join Generate G where G.Report_id = 'R15';

3. Give the faculty id and credit card no. using which max fuel is purchased
   ⇒ Select Faculty_id, CC_no from Trip_Completion_Form where Fuel_purchased = (Select max(Fuel_purchased) from Trip_Completion_Form);

4. Display the records of vehicle in sorted order of their mileage from lowest to highest
   ⇒ Select * from Vehicle order by Mileage asc;

5. Display all records of parts usage report where report is issued after '2019 – 12 - 21'
   ⇒ Select * from Parts_Usage_Report where Issue_Date > Date '2019 – 12 - 21';

Relational

1. Give the Trip Completion form no. which has no maintenance complaints
   ⇒ $\pi_{Form\_no}(\sigma_{Maintenance\_Complaint = NULL}(Trip\_Completion\_Form))$

2. Give the odometer start and end reading with vehicle no. RJ82F2478
   ⇒ $\pi_{OR\_start, OR\_end}(\sigma_{Vehicle\_No = RJ82F2478}(Trip\_Completion\_Form))$

3. Give Parts Code of the Parts whose quantity is less than 20
   ⇒ $\pi_{Parts\_code}(\sigma_{Quantity < 20}(Parts))$

4. Give the faculty id and name of the faculty in department no. 3
   ⇒ $\pi_{Faculty\_id, Name}(\sigma_{DNo = 3}(Faculty))$

5. Give the details of the Parts Usage Report issued on date 2021-04-30
   ⇒ $\pi_{Id, Type, Total\_pages, Qty\_used, Parts\_code, Mgr\_id}(\sigma_{Issue\_Date = 2021\text{-}04\text{-}30}(Parts\_Usage\_Report))$

- **Anushaka (19595)**

  SQL

  1. Give the reservation detail with form no RF2
  - SELECT * FROM RESERVATION_FORM WHERE FROM_NO = 'RF2';

  2. Give the id, issue date, type and vehicle no. issued with the vehicle id v3
  - SELECT ID,ISSUE_DATE, TYPE, VEHICLE_NO FROM VEHICLE_MAINTENANCE_SUMMARY WHERE VEHICLE_ID = 'V3';

  3. Give the avg number of pages used to print vehicle maintenance summary
  - SELECT AVG(TOTAL_PAGES) AS AVG)PAGES FROM VEHICLE_MAINTENANCE_SUMMARY;

  4. Give the name of the part which have quantity less than 10
  - SELECT NAME FROM PARTS WHERE QUANTITY < 10;

  5. Give the type of report with vehicle id is V10 And issue date is 30-JUNE-19.
  - SELECT TYPEFROM REPORT WHERE VEHICLE_ID = 'V10' AND ISSUE_DATE = '30-JUNE-19' ;

  Relational

  1. Give the issue date of revenue report with id = R11
  - $\pi_{issue\_date}\ (\sigma_{ID=R11}\ (Revenue\_Report))$

  2. Give the details on report which is issued on date feb-15-2019
  - $\pi_{Type,\ ID,\ Total\_Pages,\ Vehicle\_ID}\ (\sigma_{Issue\_Date\ =\ 15\text{-}feb\text{-}2019}\ (Report))$

  3. Give the trip completion form number of the vehicle no = UK54M2277
  - $\pi_{Form\_No}\ (\sigma_{Vehicle\_No.\ =\ UK54M2277}\ (TRIP\_COMPLETION\_FORM))$

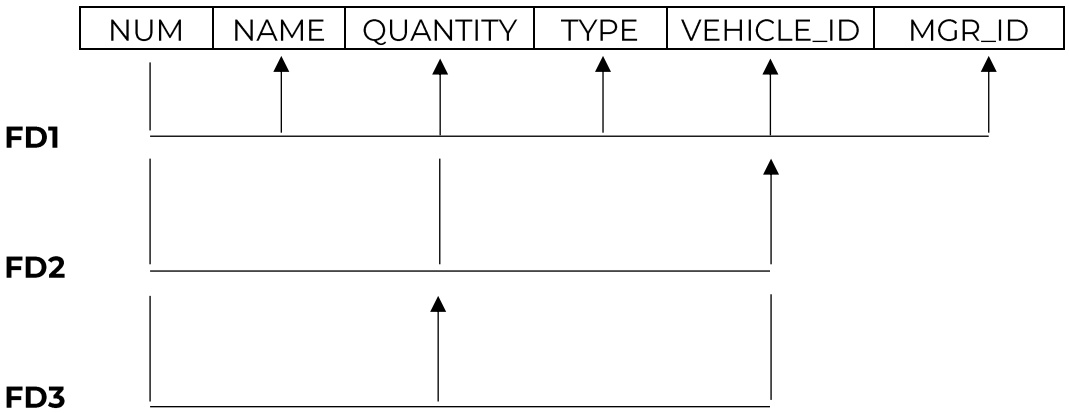
  4. Give reservation form no. of vehicle which has VEHICLE type = MINIBUS
  - $\pi_{FORM\_NO}\ (\sigma_{VEHICLE\_TYPE\ =\ MINIBUS}\ (RESERVATION\_FORM))$

  5. Give details on parts whose quantity is more than 50
  - $\pi_{Parts\_Code,\ Name,\ Usage,\ Type}\ (\sigma_{Quantity\ >\ 50}\ (Parts))$

- **Normalisation**

All tables are in 1NF, 2NF, 3NF and BCNF except for the table:

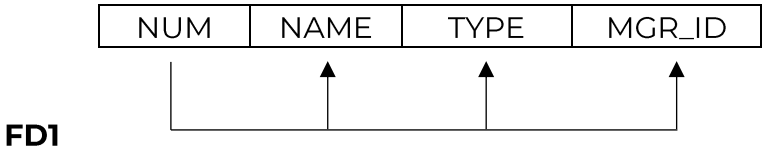
PARTS INVENTORY



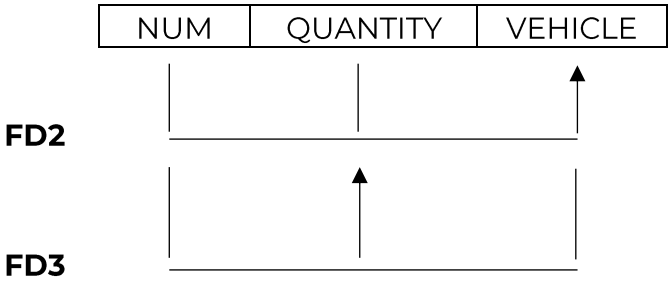
- **Primary Key** – NUM
- **Functional Dependencies**
  1. FD1 – NUM → NAME, TYPE, VEHICLE_ID, MGR_ID
  2. FD2 – (NUM, QUANTITY) → VEHICLE_ID
  3. FD3 – (NUM, VEHICLE_ID) → QUANTITY

FD2 and **FD3** violates **NF1**, hence decomposing **PARTS INVENTORY** into **PARTS INVENTORY 1** & **PARTS INVENTORY 2**

PARTS INVENTORY 1



PARTS INVENTORY 2

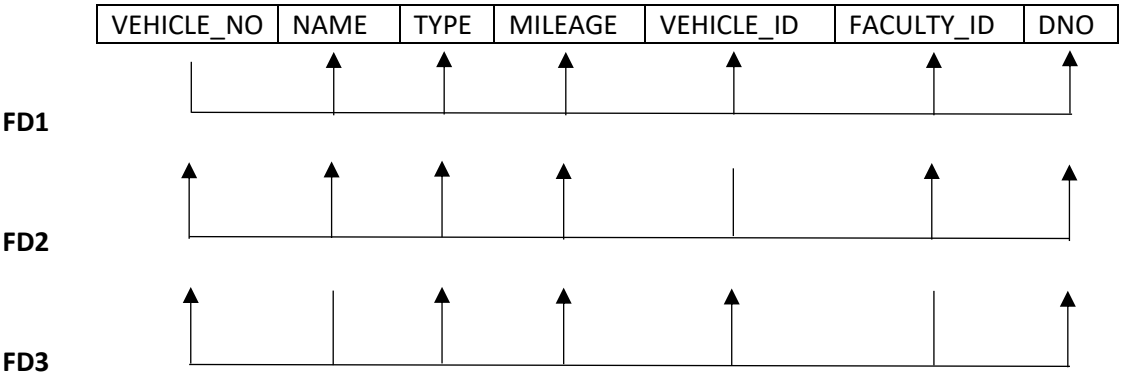


PARTS INVENTORY					
NUM	NAME	QUANTITY	TYPE	VEHICLE ID	MGR_ID
PI1	INV1	3	PARTS	V3	PM1
		2		V9	
PI2	INV2	2	OIL FILTER	V7	PM1
		4		V6	
		1		V9	
PI3	INV3	1	AIR FILTER	V10	PM2
		3		V5	
		2		V8	
PI4	INV4	3	BELTS	V2	PM1
PI5	INV5	3	OIL	V10	PM2

PARTS INVENTORY 1			
NUM	NAME	TYPE	MGR_ID
PI1	INV1	PARTS	PM1
PI2	INV2	OIL FILTER	PM1
PI3	INV3	AIR FILTER	PM2
PI4	INV4	BELTS	PM1
PI5	INV5	OIL	PM2

PARTS INVENTORY 2		
NUM	QUANTITY	VEHICLE ID
PI1	3	V3
PI1	2	V9
PI2	2	V9
PI2	4	V6
PI2	1	V9
PI3	1	V10
PI3	3	V5
PI3	2	V8
PI4	3	V2
PI5	3	V10

VEHICLE



Candidate Key – VEHICLE_NO, VEHICLE_ID, {NAME, FACULTY_ID}

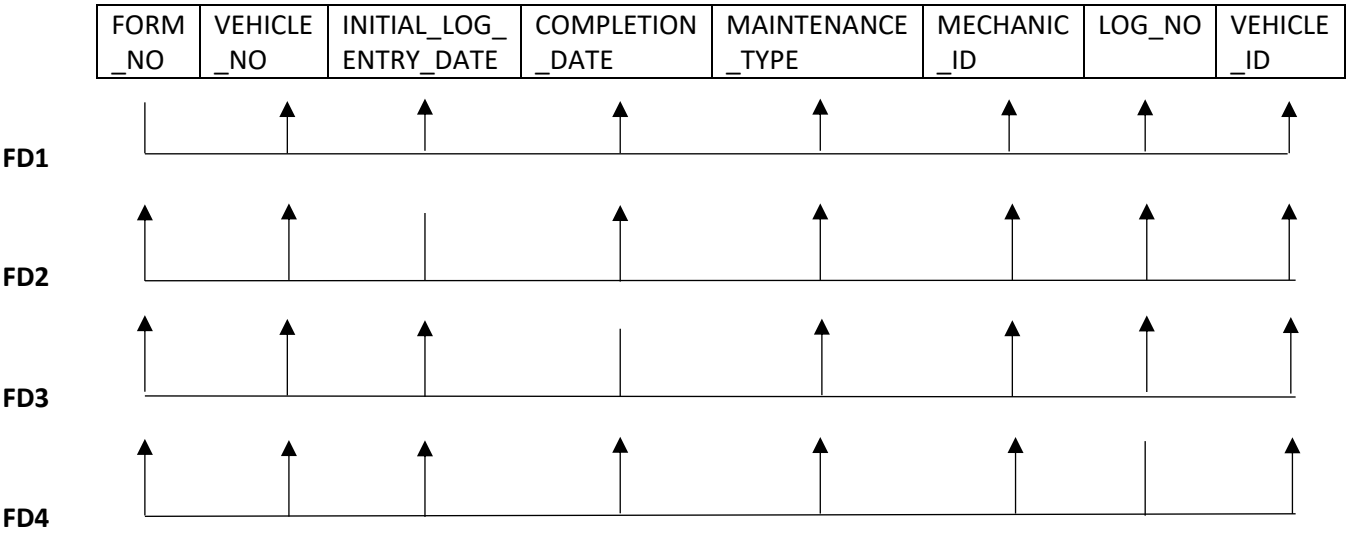
Primary Key – VEHICLE_NO

Functional Dependencies

1. **FD1** - VEHICLE_NO → NAME, TYPE, MILEAGE, VEHICLE_ID, FACULTY_ID, DNO
2. **FD2** - VEHICLE_ID → VEHICLE_NO, NAME, TYPE, MILEAGE, FACULTY_ID, DNO
3. **FD3** - {NAME, FACULTY_ID} → VEHICLE_NO, TYPE, MILEAGE, VEHICLE_ID, DNO

VEHICLE Table is in **BCNF**

MAINTENANCE LOG FORM



Candidate Key - FORM_NO, LOG_NO, INITIAL_LOG_ENTRY_DATE, COMPLETION_DATE

Primary Key – FORM_NO

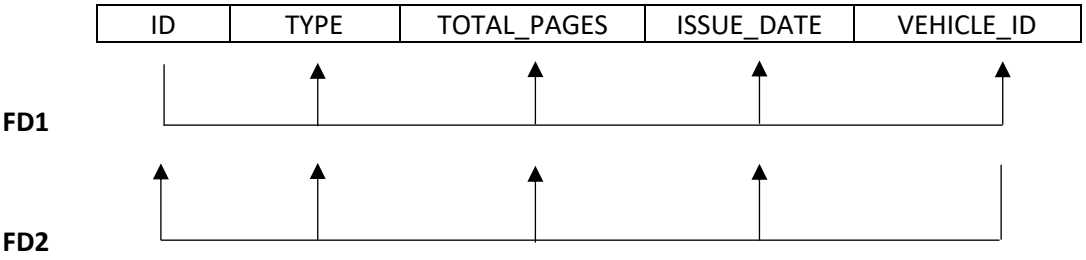
Functional Dependencies

1. **FD1** - FORM_NO → VEHICLE_NO, INITIAL_LOG_ENTRY_DATE, COMPLETION_DATE, MAINTENANCE_TYPE, MECHANIC_ID, LOG_NO, VEHICLE_ID

2. **FD2** – LOG_NO --> FORM_NO, VEHICLE_NO, INITIAL_LOG_ENTRY_DATE, COMPLETION_DATE, MAINTENANCE_TYPE, MECHANIC_ID, VEHICLE_ID
3. **FD3** – INITIAL_LOG_ENTRY_DATE --> FORM_NO, VEHICLE_NO, COMPLETION_DATE, MAINTENANCE_TYPE, MECHANIC_ID, LOG_NO, VEHICLE_ID
4. **FD4** – COMPLETION_DATE --> FORM_NO, VEHICLE_NO, INITIAL_LOG_ENTRY_DATE, MAINTENANCE_TYPE, MECHANIC_ID, LOG_NO, VEHICLE_ID

MAINTENANCE LOG FORM is in **BCNF**

REPORT



Candidate Key - ID, VEHICLE_ID

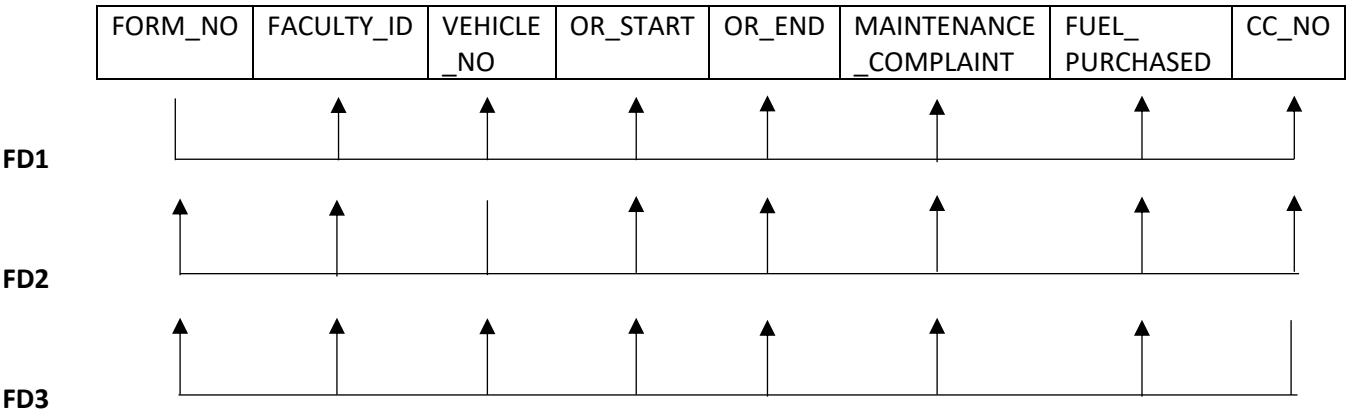
Primary Key - ID

Functional Dependencies

1. **FD1** – ID → TYPE, TOTAL_PAGES, ISSUE_DATE, VEHICLE_ID
2. **FD2** – VEHICLE_ID → ID, TYPE, TOTAL_PAGES, ISSUE_DATE

REPORT is in **BCNF**

TRIP COMPLETION FORM



Candidate Key - FORM_NO, VEHICLE_NO, CC_NO

Primary Key – FORM_NO

Functional Dependencies

1. **FD1** - FORM_NO --> FACULTY_ID, VEHICLE_NO, OR_START, OR_END, MAINTENANCE_COMPLAINT, FUEL_PURCHASED, CC_NO
2. **FD2** - VEHICLE_NO --> FORM_NO, FACULTY_ID, OR_START, OR_END, MAINTENANCE_COMPLAINT, FUEL_PURCHASED, CC_NO
3. **FD3** -CC_NO --> FORM_NO, FACULTY_ID, VEHICLE_NO, OR_START, OR_END, MAINTENANCE_COMPLAINT, FUEL_PURCHASED

TRIP COMPLETION FORM is in **BCNF**