**Rental System**

Peter runs a small car rental company with 10 cars and 5 trucks. He engages you to design a web portal to put his operation online.

For the initial phase, the web portal shall provide these basic functions:

1. Maintaining the records of the vehicles and customers.
2. Inquiring about the availability of vehicle, and
3. Reserving a vehicle for rental.

A customer record contains his/her name, address and phone number.

A vehicle, identified by the vehicle registration number, can be rented on a daily basis. The rental rate is different for different vehicles. There is a discount of 20% for rental of 7 days or more.

A customer can rental a vehicle from a start date to an end date. A special customer discount, ranging from 0-50%, can be given to preferred customers.

**Database**

The initial database contains 3 tables: vehicles, customers, and rental\_records. The rental\_records is a *junction table* supporting many-to-many relationship between vehicles and customers.

DROP DATABASE IF EXISTS `rental\_db`;

CREATE DATABASE `rental\_db`;

USE `rental\_db`;

-- Create `vehicles` table

DROP TABLE IF EXISTS `vehicles`;

CREATE TABLE `vehicles` (

`veh\_reg\_no` VARCHAR(8) NOT NULL,

`category` ENUM('car', 'truck') NOT NULL DEFAULT 'car',

-- Enumeration of one of the items in the list

`brand` VARCHAR(30) NOT NULL DEFAULT '',

`desc` VARCHAR(256) NOT NULL DEFAULT '',

-- desc is a keyword (for descending) and must be back-quoted

`photo` BLOB NULL, -- binary large object of up to 64KB

-- to be implemented later

`daily\_rate` DECIMAL(6,2) NOT NULL DEFAULT 9999.99,

-- set default to max value

PRIMARY KEY (`veh\_reg\_no`),

INDEX (`category`) -- Build index on this column for fast search

) ENGINE=InnoDB;

-- MySQL provides a few ENGINEs.

-- The InnoDB Engine supports foreign keys and transactions

DESC `vehicles`;

SHOW CREATE TABLE `vehicles` \G

SHOW INDEX FROM `vehicles` \G

-- Create `customers` table

DROP TABLE IF EXISTS `customers`;

CREATE TABLE `customers` (

`customer\_id` INT UNSIGNED NOT NULL AUTO\_INCREMENT,

-- Always use INT for AUTO\_INCREMENT column to avoid run-over

`name` VARCHAR(30) NOT NULL DEFAULT '',

`address` VARCHAR(80) NOT NULL DEFAULT '',

`phone` VARCHAR(15) NOT NULL DEFAULT '',

`discount` DOUBLE NOT NULL DEFAULT 0.0,

PRIMARY KEY (`customer\_id`),

UNIQUE INDEX (`phone`), -- Build index on this unique-value column

INDEX (`name`) -- Build index on this column

) ENGINE=InnoDB;

DESC `customers`;

SHOW CREATE TABLE `customers` \G

SHOW INDEX FROM `customers` \G

-- Create `rental\_records` table

DROP TABLE IF EXISTS `rental\_records`;

CREATE TABLE `rental\_records` (

`rental\_id` INT UNSIGNED NOT NULL AUTO\_INCREMENT,

`veh\_reg\_no` VARCHAR(8) NOT NULL,

`customer\_id` INT UNSIGNED NOT NULL,

`start\_date` DATE NOT NULL DEFAULT '0000-00-00',

`end\_date` DATE NOT NULL DEFAULT '0000-00-00',

`lastUpdated` TIMESTAMP NOT NULL DEFAULT CURRENT\_TIMESTAMP ON UPDATE CURRENT\_TIMESTAMP,

-- Keep the created and last updated timestamp for auditing and security

PRIMARY KEY (`rental\_id`),

FOREIGN KEY (`customer\_id`) REFERENCES `customers` (`customer\_id`)

ON DELETE RESTRICT ON UPDATE CASCADE,

-- Disallow deletion of parent record if there are matching records here

-- If parent record (customer\_id) changes, update the matching records here

FOREIGN KEY (`veh\_reg\_no`) REFERENCES `vehicles` (`veh\_reg\_no`)

ON DELETE RESTRICT ON UPDATE CASCADE

) ENGINE=InnoDB;

DESC `rental\_records`;

SHOW CREATE TABLE `rental\_records` \G

SHOW INDEX FROM `rental\_records` \G

-- Inserting test records

INSERT INTO `vehicles` VALUES

('SBA1111A', 'car', 'NISSAN SUNNY 1.6L', '4 Door Saloon, Automatic', NULL, 99.99),

('SBB2222B', 'car', 'TOYOTA ALTIS 1.6L', '4 Door Saloon, Automatic', NULL, 99.99),

('SBC3333C', 'car', 'HONDA CIVIC 1.8L', '4 Door Saloon, Automatic', NULL, 119.99),

('GA5555E', 'truck', 'NISSAN CABSTAR 3.0L', 'Lorry, Manual ', NULL, 89.99),

('GA6666F', 'truck', 'OPEL COMBO 1.6L', 'Van, Manual', NULL, 69.99);

-- No photo yet, set to NULL

SELECT \* FROM `vehicles`;

INSERT INTO `customers` VALUES

(1001, 'Tan Ah Teck', '8 Happy Ave', '88888888', 0.1),

(NULL, 'Mohammed Ali', '1 Kg Java', '99999999', 0.15),

(NULL, 'Kumar', '5 Prince Road', '55555555', 0),

(NULL, 'Kevin Jones', '2 Sunset boulevard', '22222222', 0.2);

SELECT \* FROM `customers`;

INSERT INTO `rental\_records` VALUES

(NULL, 'SBA1111A', 1001, '2012-01-01', '2012-01-21', NULL),

(NULL, 'SBA1111A', 1001, '2012-02-01', '2012-02-05', NULL),

(NULL, 'GA5555E', 1003, '2012-01-05', '2012-01-31', NULL),

(NULL, 'GA6666F', 1004, '2012-01-20', '2012-02-20', NULL);

SELECT \* FROM `rental\_records`;

Q1:

Customer 'Tan Ah Teck' has rented 'SBA1111A' from today for 10 days. (Hint: You need to insert a rental record. Use a SELECT subquery to get the customer\_id. Use CURDATE() (or NOW()) for today; and DATE\_ADD(CURDATE(), INTERVAL x unit) to compute a future date.)

Q2:

List all rental records (start date, end date) with vehicle's registration number, brand, and customer name, sorted by vehicle's categories followed by start date.

Q3: List all the expired rental records (end\_date before CURDATE()).

Q4: List the vehicles rented out on '2012-01-10' (not available for rental), in columns of vehicle registration no, customer name, start date and end date. (Hint: the given date is in between the start\_date and end\_date.)

Q5: List all vehicles rented out today, in columns registration number, customer name, start date, end date.

Q6: Similarly, list the vehicles rented out (not available for rental) for the period from '2012-01-03' to '2012-01-18'. (Hint: start\_date is inside the range; or end\_date is inside the range; or start\_date is before the range and end\_date is beyond the range.)

Q7: List the vehicles (registration number, brand and description) available for rental (not rented out) on '2012-01-10' (Hint: You could use a subquery based on a earlier query).

Q8: Similarly, list the vehicles available for rental for the period from '2012-01-03' to '2012-01-18'.

Q9: Similarly, list the vehicles available for rental from today for 10 days.

Q10: Foreign Key Test:

* 1. Try deleting a parent row with matching row(s) in child table(s), e.g., delete 'GA6666F' from vehicles table (ON DELETE RESTRICT).
  2. Try updating a parent row with matching row(s) in child table(s), e.g., rename 'GA6666F' to 'GA9999F' in vehicles table. Check the effects on the child table rental\_records (ON UPDATE CASCADE).
  3. Remove 'GA6666F' from the database (Hints: Remove it from child table rental\_records; then parent table vehicles.)

Q11: Payments: A rental could be paid over a number of payments (e.g., deposit, installments, full payment). Each payment is for one rental. Create a new table called payments. Need to create columns to facilitate proper audit check (such as create\_date, create\_by, last\_update\_date, last\_update\_by, etc.)