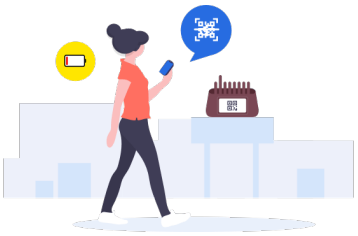
**COMP3278 Introduction to Database Management Systems**
**Assignment 2**
**Database Application Development for the ABC PowerBank Rental Service**

***Due Date: 22 March 2024 17:30***
***(TA in charge: Tom)***



The database schema solution developed in Assignment 1 has been adopted by the company with some simplification. The schemas are shown below (The underlined attributes represent the primary key of the relation).

- **Member** (member_ID, name, email, contact_number)
- **ServiceArea** (service_area_ID, name, parent_area_ID)
  - *parent_area_ID:* References *ServiceArea.service_area_ID*
  - *parent_area_ID* can accept NULL value.
- **ChargingStation** (station_ID, name, location_ID, available_pbs)
  - *location_ID*: References *ServiceArea.service_area_ID*
- **PowerBank** (pb_ID, station_ID, status)
  - *station_ID*: References *ChargingStation.station_ID*, indicating the charging station where the power bank is located.
  - *station_ID* can accept NULL value.
  - *status*: Indicates the availability of the power bank. There are two possible values: *0* indicates the power bank is unavailable, and *1* indicates the power bank is available in the charging station.
- **Coupon** (coupon_ID, redemption, expiration_date, discount_value, member_ID)
  - *member_ID*: References *Member.member_ID*, associating the coupon with a member.
  - There are two possible values for *redemption: 0* indicates the coupon hasn't been redeemed, and *1* indicates the coupon has been redeemed.
- **RentalTransaction** (transaction_ID, member_ID, pb_ID, station_ID, start_datetime, end_datetime, payment_amount, status, coupon_ID)
  - *member_ID*: References *Member.member_ID*, indicating the member involved in the rental.
  - *pb_ID*: References *PowerBank.pb_ID*, indicating the rented power bank.
  - *end_datetime*, *payment_amount, and coupon_ID* can accept NULL value.
  - *station_ID:* References ChargingStation.station_ID
  - *coupon_ID:* References Coupon.coupon_ID

    - *status*: Indicates the status of the transaction.
        - There are two possible values of *status*: *0* indicates an ongoing transaction, and *1* indicates a completed transaction.
- **Reservation** (reservation_ID, member_ID, station_ID, reservation_datetime, collect_datetime, status)
    - *member_ID*: References *Member.member_ID*, indicating the member who made the reservation.
    - *station_ID*: References *ChargingStation.station_ID*.
    - *reservation_datetime* is the time of making the reservation. The reservation is only on hold for 30 mins.
    - *collect_datetime* is the time of user has collected the power bank from the reserved charging station.
    - *status*: There are three possible values. 0 indicates the reservation is ongoing, 1 indicates the reservation is completed (the power bank has been collected from the reserved charging station), and 2 indicates the reservation has been canceled.

**Requirements**

1) **[20%] Build the database using MySQL.**
    - Using the schemas above, define tables with appropriate constraints.
    - Store the corresponding table definition commands in an SQL file called "tables.sql" (Please include also the referential constraints in the .sql file, make sure that the files can correctly build the necessary tables and constraints when imported to another database).

2) **[80%] Answer queries and display results**
    - Build from q1.php to q9.php, which solves the following nine queries, and displays the result in a web browser.
    - Note that besides the nine PHP files, you have to include one more file q8_submit.php, we will explain the use of q8_submit.php later.
    - Browse the following page for the expected output of the PHP files with the given sample data: https://i.cs.hku.hk/~zrxie/as2_2024/index.html
    - Please make sure the output tables have the same column name and column orders as shown in the above expected output.

**[Given sample]** Show the *member_ID*, *name*, and *reservation_ID* for the *reservation_datetime* records that are on 2024-02-04.

**Q1. [5%]** Display the *station_ID*, and *name* for the charging station, where the *name* begins with "Pokfulam".

- Case-sensitive string matching.
- Sort the results by *station_ID* in ascending order.

**Q2. [5%]** For the coupons that have been redeemed, display the *coupon_ID*, *discount_value* of coupons, the *member_ID*, and the *name* of the member as well as the *payment_amount* of the involved transaction.

- Sort the records by the *payment_amount* of the corresponding redeemed transaction in descending order, then ascending order of *member_ID*.

**Q3. [10%]** Display all charging stations (*station_ID*, *name, available_pbs*) and the *name* of the ServiceArea.

- *available_pbs* is the number of *PowerBanks* available in the charging station, this number can be 0.
- Sort the records in descending order of *available_pbs*, then ascending order of *station_ID*.

**Q4. [10%]** Display the *member_ID*, *name*, and *rental_count* for members who have completed at least one rental transaction.

- *rental_count* is the total number of rental transactions completed by the member.
- Sort the records in descending order of *rental_count*, then ascending order of *member_ID*.

**Q5. [10%]** Display the *station_ID*, *station_name*, s*um_of_completed_reservation* of the *Reservation* with the *ChargingStation*(s) in the ServiceArea of "Central and West".

- The *ChargingStation*(s) in the sub-ServiceArea(s) of "Central and West" will be included in the result.
- *sum_of_completed_reservation* is the number of the completed reservation for the *ChargingStation*, this number can be 0.
- To simplify this question, you can assume that there is at most a 3-layer hierarchy structure of the *ServiceArea*.
- Sort the results by *sum_of_completed_reservation* in descending order, then *station_ID* in ascending order.

**Q6. [10%]** Display *station_ID*, *station_name*, and *rental_income* for each of the charging stations in February 2024.

- Sort the results by *rental_income* in descending order, then *station_ID* in ascending order.
- *rental_income* is the sum of the *payment_amount* in a given period.

**Q7. [10%]** Display all reservations (*reservation_ID*, *member_ID*, *member_name*, *station_ID*, *reservation_datetime, collect_datetime, email*) that have been collected within 15 mins from the *reservation_datetime*.

- *email* is the email of the member making the reservation.

- Sort by *reservation_datetime* in ascending order, then *reservation_ID* in descending order.
- You may use TIMESTAMPDIFF() to solve this question. For example, TIMESTAMPDIFF(MINUTE, '2023-01-01 10:00:00', '2023-01-01 12:30:00') calculates the difference in minutes between 10:00 AM and 12:30 PM on January 1st, 2023, returning 150.

**Q8. [15%]** In q8_submit.php, create a drop-down menu listing all the *service_area_name* and *charging_station_count* of the charging stations on the *ServiceArea* without a parent-service area.

- *service_area_name* is the name of the *SeriveArea*.
- We can assume that there is at most a 3-layer hierarchy structure of the *ServiceArea*.
- *Charging_station_count* is the total number of charging stations in the *ServiceArea*.
- Only list the record(s) with *station_count* >= 1.
- The drop-down menu contains options in the format of "*service_area_name*: *charging_station_count*".
- Sort the drop-down menu by the *charging_station_count* in descending order, and then ascending by *service_area_ID*.
- Add a submit button, and after clicking the submit button, the page will be directed from q8_submit.php to q8.php.

In q8.php, display *station_ID*, *station_name*, and *available_pbs* of the charging stations in the *ServiceArea* selected from q8_submit.php

- Sort the records by *available_pbs* in descending order, then in ascending order by *station_ID*.

**Q9. [15%]** Enhance q8.php by making each *station_name* a hyperlink to q9.php?station_ID=x, where *x* is the *station_ID* of the selected charging station.

- In q9.php, display the *reservation_ID*, *member_ID*, *reservation_datetime*, and member's contact information (*name*, *email*, *contact_number*) for all completed reservations of the selected charging station *x*.
- Sort by *reservation_datetime* in ascending order, then ascending by *member_ID*.

**Hand in**

1. Please compress "tables.sql", and all the related PHP files into one zip file and use your student number to name it (e.g. 303004954x.zip).
2. Please submit this zip file through our Moodle system before the deadline.
3. Tutorial 2 contains useful information. Please refer to these tutorials if necessary.
4. Please do not submit the files with the sample data.
5. The data we use to grade your assignment may differ from the sample data.

**If you encounter difficulty in this assignment, please feel free to post your questions on the Moodle forum or contact us (TA Tom zerong@connect.hku.hk) We are very happy to help.**

We wish you enjoy learning database technologies in this course!