## Assignment: HOTEL MANAGEMENT SYSTEM

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Q. *You are tasked with developing a basic hotel management system that includes both frontend and backend components. The system should allow hotel staff to perform the following operations:*

1. **Room Management**: Add, update, or delete room information (e.g., room number, type, status, and price).
2. **Booking Management**:
    a. Create, update, or cancel reservations for guests, including capturing guest details, check-in, and check-out dates.
    b. Allow users to view, modify, or cancel their bookings from their account.
    c. Provide real-time updates on booking status and any changes (e.g., flight delays).
3. **Payment Processing**: Record payments from guests, with options for different payment methods (e.g., credit card, cash, etc.).
4. **User Authentication**: Implement a login system with different user roles (e.g., admin, receptionist) and permissions.
5. **Reporting**: Generate basic reports, such as occupancy rates and revenue over a selected period.
6. **Notifications and Alerts**:
    a. Implement email or SMS notifications for booking confirmations, reminders, and updates.

*The frontend should be user-friendly and responsive, ensuring accessibility across different devices. The backend should be robust, secure, and able to handle multiple simultaneous users.*

*Considerations:*

- **Technology Stack**: You may choose technologies such as HTML/CSS/JavaScript for the frontend, and Node.js, Python, or Java for the backend. Use a relational database like MySQL.
- **Security**: Implement basic security measures such as input validation, password hashing, and session management.
- **Scalability**: While the system is basic, consider future scalability in your design.

*Deliverables:*

- ***Lab_1:***
    - ER Diagram **[10 points]**
    - Table creation, insertion of dummy records in all tables - using Python interface with SQL **[30 points]**
    - Making sure that all tables are atleast in 2NF; identify trade offs between taking it up to 3NF / BCNF or letting the tables be at 2NF. **[10 points]**

- Study and write a short note on the hashing and indexing schemes underlying MYSQL **[5 points]**
- Design a hash function (using Python) - that take into consideration alphabets common in all the roll numbers of the group-members - for effective storage/retrieval of data - on the 'Room Management' table **[10 points]**
- Apply clustering indexing on the data (using Python) in the 'Room Management' table. **[10 points]**
- Apply secondary indexing on the data (using Python) in the 'Room Management' table. **[10 points]**
- Compare and contrast between the storage and execution time of the clustering vs secondary indexing schemes designed by you **[20 points]**
- Besides the SQL queries for the aforementioned operations, write queries to: **[15 points]**
  - Add information about the inclusion of a new wing comprising 5 deluxe suites
  - Prepare a report on all guest bookings and cancellations in the month of August, 2024
  - Cancel all guest bookings made after 7PM for August 15, 2024.

*Rubric:*
Deliverables as asked: 120 points
Web interface: 5 points

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- ***Lab_2***
  - Write SQL queries [using C and Python] for the following questions **[60 points]**:
    - Extract a list of all <room_number, type> who had bookings in all months in 2023.
    - From the above list, print the names of all months who have at least one 'deluxe suite' booking.
    - Extract a list of all <room_type> information for whom the database does not have any artwork listing
    - Print a list of all guests who have made a booking of 'single_room' in 2022.
    - From the above list, derive a list of the guest_name and their profile information.
    - Derive a list of all <guest_profiles> who have not made any purchases.
  - Write optimized relational algebra expressions for the above queries. **[30 points]**
  - Convert the above expressions to equivalent SQL queries [using C and Python]. **[30 points]**

- Evaluate the evaluation time of the two queries you have written. What differences do you note [inter & intra-language]? **[10 points]**
- Write a short note on the search algorithm made by the SQL package you are using. **[10 points]**
- Write a note on how this algorithm potentially affects the execution time of your queries. **[10 points]**
- Write a note on the compilation / interpretation strategy of C and Python languages. **[5 points]**

*Total:* 155 Points