

SCHOOL OF ENGINEERING AND TECHNOLOGY

COURSEWORK FOR

BSC (HONS) IN COMPUTER SCIENCE
BSC (HONS) INFORMATION TECHNOLOGY
BACHELOR OF SOFTWARE ENGINEERING (HONS)
BSC (HONS) INFORMATION SYSTEMS (DATA ANALYTICS)
BSC (HONS) INFORMATION TECHNOLOGY (COMPUTER NETWORKING AND SECURITY)

YEAR 1; ACADEMIC SESSION APRIL 2024

SEG1201: DATABASE FUNDAMENTALS

Parts 1 – 4 Due date: Week 13 Monday, 9am

Part 5 – refer to the given schedule

SEG1201: DATABASE FUNDAMENTALS

**STUDENT NAMES: AYU WEN LI, KEERTANA A/P SUBRAMANIAM,
SIOW QI YUNG, WONG HUI SAN
STUDENT IDS: 22017867, 23109614, 22053037, 22034540**

INSTRUCTIONS

- This final assessment contributes 50% to your final grade.
- This five-member group assignment (or minimum 3-member group) is primarily for Course Learning Outcome 2 - Implement a database design group project using appropriate tools such as Oracle SQL.

IMPORTANT

The University requires students to adhere to submission deadlines for any form of assessment. Penalties are applied in relation to unauthorized late submission of work.

Academic Honesty Acknowledgement

“We, Ayu Wen Li, Keertana A/P Subramaniam, Siow Qi Yung and Wong Hui San, verify that this paper contains entirely our own work. We have not consulted with any outside person or materials other than what was specified (an interviewee, for example) in the assignment or the

syllabus requirements. Further, we have not copied or inadvertently copied ideas, sentences, or paragraphs from another student. We realize the penalties (*refer to page 16, 5.5, Appendix 2, page 44 of the student handbook diploma and undergraduate programme*) for any kind of copying or collaboration on any assignment.”

wenli, keertana, qiyung, huisan (21/7/2024)

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General information:

No	Student ID	Name	Email address
1	22017867	AYU WEN LI	22017867@imail.sunway.edu.my
2	22034540	WONG HUI SAN	22034540@imail.sunway.edu.my
3	22053037	SIOW QI YUNG	22053037@imail.sunway.edu.my
4	23109614	KEERTANA A/P SUBRAMANIAM	23109614@imail.sunway.edu.my

Part 1: Generate a case scenario & draw an ERD (10 marks)

DreamHaven, established in 2018, has become a leading online marketplace for lodging, connects travellers with hosts offering unique places to stay in Malaysia. The platform facilitates seamless communication and transactions between hosts and guests, ensuring a memorable travel experience.

DreamHaven users (guests & hosts), including both frequent travellers and occasional vacationers, utilize the platform to book accommodations for their trips. Many travellers prefer staying in unique, locally owned properties rather than traditional hotels. Hosts, who offer their properties on DreamHaven, enjoy meeting new people and sharing their knowledge of the area with their guests.

All host on DreamHaven have a unique HostID, along with attributes such as name, email, phone number, date of birth, and join date (date of registration on the platform). Hosts on DreamHaven must be at least 18 years old to register.

All guest on DreamHaven have a unique GuestID, along with attributes such as name, email, phone number, date of birth, and join date. Guests on DreamHaven must be at least 18 years old to register.

Hosts list their properties on the platform, each with a unique PropertyID. Each property has several attributes, including the HostID, a name, a detailed description, street name, state, price per night and status. Each property must have a unique address to avoid confusion and overlaps.

Guests browse through various listings and decide to book properties that meet their needs. To make a booking, guests must provide a check-in date and a check-out date, ensuring the booking is made at least 24 hours before the check-in date. The booking has a unique BookingID and includes the PropertyID and GuestID. The total amount for the booking is calculated based on the number of nights and the price per night. The booking status can be either pending, confirmed, or cancelled.

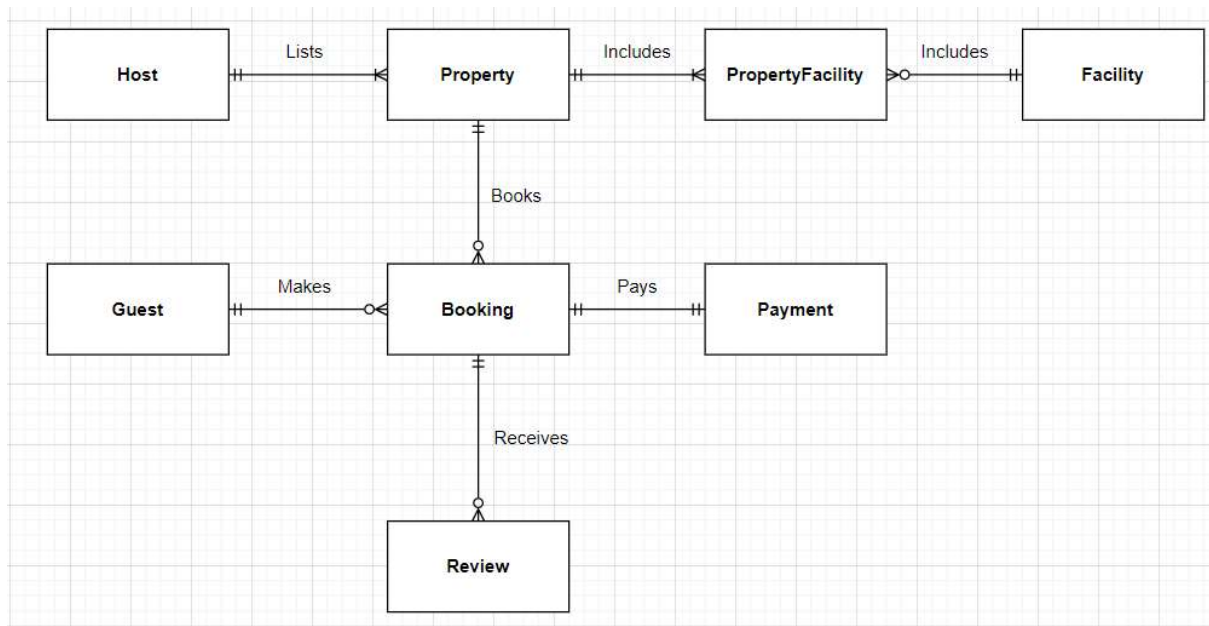
Once a booking is confirmed, guests proceed with the payment. Each payment has a unique PaymentID, the associated BookingID, the payment date, and the payment method (such as credit card, PayPal, or bank transfer). Payments must be processed within 24 hours of booking confirmation.

After their stay, guests can leave reviews for the properties they booked. Reviews can only be submitted after the check-out date of the booking. Each review has a unique ReviewID, the associated BookingID, the review date, a rating between 1 and 5 stars, and a comment. A booking can have multiple reviews, capturing feedback from different guests over time. However, leaving a review is optional.

Hosts can also specify the facilities available at their properties, such as swimming pools, gyms, or parking garages, kitchen. Each facility has a unique FacilityID, a name, a description, opening hours, closing hours and rules. Properties can have multiple facilities, and a facility can be shared by multiple properties within a certain vicinity.

Part 1: Generate a case scenario & draw an ERD (10 marks)

a) ERD diagram



ERD Relationships:

1. **Host (1) LISTS (M) Property (Mandatory)**
 - A host must list at least one property.
2. **Guest (1) MAKES (M) Booking (Optional)**
 - A guest can make multiple bookings but is not required to.
3. **Property (1) BOOKS (M) Booking (Optional)**
 - A property can be booked multiple times, but a property may exist without any bookings.
4. **Booking (1) RECEIVES (M) Review (Optional)**
 - A booking can have multiple reviews, but leaving a review is optional.
5. **Booking (1) PAYS (1) Payment (Mandatory)**
 - Every booking must have one payment associated with it.
6. **Property (1) INCLUDES (M) PropertyFacility (Optional)**
 - Each property can have multiple facilities, but it is not mandatory to have a facility.
7. **Facility (1) INCLUDES (M) PropertyFacility (Optional)**
 - A facility can be associated with multiple properties but may exist without being associated with any property.

b) Business rules

1. Hosts and guests must be at least 18 years old to register on DreamHaven.
2. Each property must have a unique address.
3. A booking must be made at least 24 hours before the check-in date.
4. A guest can cancel a booking up to 48 hours before the check-in date for a full refund.
5. The host must confirm or decline a booking request within 24 hours.
6. A review can only be submitted after the check-out date of the booking.
7. A rating in a review must be between 1 and 5 stars.
8. Payments must be processed within 24 hours of booking confirmation.
9. All payment amount has included the tax.
10. Each property must belong to only one host.
11. Property must only be in Malaysia.
12. A host must have at least one property listed to be considered a host.
13. A review or a rating must only be made by a guest and not a host.
14. A host cannot be a guest and vice versa.

Part 2: Design a relational data (35 marks)

a) Relational Database Model (15 marks)

Identify the primary & an alternate key, and foreign (if any) keys for each table. List the attributes for each entity.

Host ----- HostID (Primary Key) Name Email (Alternate Key) Phone (Alternate Key) DateOfBirth JoinDate	Guest ----- GuestID (Primary Key) Name Email (Alternate Key) Phone (Alternate Key) DateOfBirth JoinDate
Property ----- PropertyID (Primary Key) HostID (Foreign Key) (Alternate Key) PropertyType (Alternate Key) NumOfBedroom Description Street (Alternate Key) State (Alternate Key) PricePerNight Status FOREIGN KEY (HostID) REFERENCES Host(HostID)	Booking ----- BookingID (Primary Key) PropertyID (Foreign Key) (Alternate Key) GuestID (Foreign Key) (Alternate Key) CheckInDate (Alternate Key) CheckOutDate BookingStatus FOREIGN KEY (PropertyID) REFERENCES Property(PropertyID) FOREIGN KEY (GuestID) REFERENCES Guest(GuestID)
Review ----- ReviewID (Primary Key) GuestID (Foreign Key) (Alternate Key) BookingID (Foreign Key) (Alternate Key) ReviewDate Rating Comment FOREIGN KEY (GuestID) REFERENCES Guest(GuestID) FOREIGN KEY (BookingID) REFERENCES Booking(BookingID)	Payment ----- PaymentID (Primary Key) BookingID (Foreign Key) (Alternate Key) PaymentDate (Alternate Key) PaymentMethod FOREIGN KEY (BookingID) REFERENCES Booking(BookingID)

Facility ----- FacilityID (Primary Key) Name (Alternate Key) OpeningHours (Alternate Key) Closing Hours (Alternate Key) Rules	PropertyFacility ----- PropertyID (Foreign Key) FacilityID (Foreign Key) PRIMARY KEY (PropertyID, FacilityID) FOREIGN KEY (PropertyID) REFERENCES Property(PropertyID) FOREIGN KEY (FacilityID) REFERENCES Facility(FacilityID)
--	--

b) Constraints (10 marks)

TABLE 2

No	Constraint type/description	Justification (why do you have this constraint)
1.	CHECK constraint in Property Table for Status Attribute: Status VARCHAR2(10) CHECK (Status IN ('Reserved', 'Available')),	CHECK is used to ensure that the status can only be either “Reserved” or “Available”, ensuring that only the specified statuses are stored in the status column.
2.	CHECK constraint in Booking Table for BookingStatus Attribute: BookingStatus VARCHAR2(10) CHECK (BookingStatus IN ('Pending', 'Confirmed', 'Cancelled')),	The CHECK constraint is used to ensure that the booking status is restricted to the valid entries of "Pending," "Confirmed," or "Cancelled”, ensuring that only the specified statuses are stored in the Booking table.
3.	CHECK constraint in Review Table for Rating attribute: Rating NUMBER CHECK (Rating BETWEEN 1 AND 5),	The CHECK constraint ensures that the rating values in the Review Table are restricted to valid entries between 1 and 5. This prevents invalid rating values from being stored.
4.	CHECK constraint in Payment Table for PaymentMethod attribute: PaymentMethod VARCHAR2(20) CHECK (PaymentMethod IN ('Credit Card', 'PayPal', 'Touch 'n Go', 'Bank Transfer')),	The CHECK constraint ensures that the payment method is restricted to the specific options used by DreamHaven which are “Credit Card”, “PayPal”, “Touch ‘n Go”, or “Bank Transfer”. This prevents the entry of any other payment methods that DreamHaven does not support.

5.	<p>CHECK constraint in Guest Table for Age attribute:</p> <pre> CREATE OR REPLACE TRIGGER trg_guest_age_check BEFORE INSERT OR UPDATE ON GUEST FOR EACH ROW BEGIN IF TRUNC(MONTHS_BETWEEN(SYSDATE, :NEW.DateOfBirth) / 12) < 18 THEN RAISE_APPLICATION_ERROR(- 20001, 'Guest must be at least 18 years old. '); END IF; END;</pre>	<p>The CHECK constraint is used to enforce the business rule that guests must be at least 18 years old. This constraint ensures that the date of birth entered in the guest table does not correspond to an age less than 18 years.</p>
6.	<p>CHECK constraint in Host Table for Age attribute:</p> <pre> CREATE OR REPLACE TRIGGER trg_host_age_check BEFORE INSERT OR UPDATE ON HOST FOR EACH ROW BEGIN IF TRUNC(MONTHS_BETWEEN(SYSDATE, :NEW.DateOfBirth) / 12) < 18 THEN RAISE_APPLICATION_ERROR(- 20001, 'Host must be at least 18 years old. '); END IF; END;</pre>	<p>The CHECK constraint is used to enforce the business rule that hosts must be at least 18 years old. This constraint ensures that the date of birth entered in the host table does not correspond to an age less than 18 years.</p>
7.	<p>UNIQUE constraint in Host Table for Email attribute:</p> <pre> Email VARCHAR2(100) UNIQUE NOT NULL,</pre>	<p>The UNIQUE constraint ensures that all values in the Email column are distinct across the table. No two rows can have the same value for the email column.</p>

c) Indexes (10 marks)

TABLE 3

No.	INDEX type/description	Justification
1.	BookingStatus field CREATE INDEX idx_booking_status ON Booking(BookingStatus);	When a customer service agent is handling large number of customer inquiries regarding the booking status, using this index can quickly filter and retrieve bookings based on booking status, whether they are pending, confirmed, or cancelled.
2.	PropertyType field, Status field CREATE INDEX idx_property_type_status ON Property(PropertyType, Status);	This index allows guest to quickly retrieve information about type of property they want to book and its availability before going on a vacation.
3.	BookingID field, Rating field CREATE INDEX idx_review_property_rating ON Review(BookingID, Rating);	A property owner is analysing guest reviews to understand how their property is performing. The index on BookingID and Rating allows the owner to gather all reviews associated with their property's bookings.
4.	GuestID field, CheckInDate field CREATE INDEX idx_booking_guest_checkindate ON Booking(GuestID, CheckInDate);	A front desk manager needs to quickly retrieve upcoming check-ins for a particular guest. The index on GuestID and CheckInDate allows them to quickly find all bookings for the guest and prepare for their arrival.
5.	NumBedroom field CREATE INDEX idx_property_num_bedroom ON Property(NumBedroom);	This index is useful for guests to retrieve data quickly when searching for the property details based on number of bedrooms to determine what size of property they are interested in.

Part 3: Implement a database (15 marks)

Guest:

1SELECT *

2FROM Guest

3

Results	Explain	Describe	Saved SQL	History	
GUESTID	NAME	EMAIL	PHONE	DATEOFBIRTH	JOINDATE
1	Bob Smith	bob.smith@example.com	441234567890	11/20/1985	12/05/2019
2	David Wilson	david.wilson@example.com	12123456792	02/25/1988	01/19/2021
3	Frank Harris	frank.harris@example.com	33123456794	04/22/1991	02/14/2022
4	Hannah Moore	hannah.moore@example.com	49123456796	03/11/1993	07/04/2023
5	Judy Anderson	judy.anderson@example.com	81123456798	10/14/1994	05/22/2024

Host:

1SELECT *

2FROM Host

3

Results

ExplainDescribeSaved SQLHistory

HOSTID	NAME	EMAIL	PHONE	DATEOFBIRTH	JOINDATE
9001	Alice Johnson	alice.johnson@example.com	0123456789	05/15/1990	06/10/2018
9002	Carol Brown	carol.brown@example.com	0123456791	07/30/1992	03/22/2020
9003	Emily Davis	emily.davis@example.com	0123456793	09/10/1995	09/30/2019
9004	Grace Miller	grace.miller@example.com	0123456795	06/17/1989	08/25/2018
9005	Ian Taylor	ian.taylor@example.com	0123456797	12/05/1987	03/11/2024

Property:

1 SELECT *

2 FROM Property

3

Results	Database Actions							
	Explain	Describe	Saved SQL	History				
PROPERTYID	HOSTID	PROPERTYTYPE	NUMBEDROOM	DESCRIPTION	STREET	STATE	PRICEPERNIGHT	STATUS
100	9001	Apartment	2	Underwater theme apartment that kids will love.	123 Main St	Malacca	100	Available
200	9002	House	4	Spacious house with a garden theme.	456 Elm St	Kuala Lumpur	150	Available
300	9003	Condo	3	Modern theme condo with sea view.	789 Pine St	Langkawi	200	Available
400	9004	Apartment	1	Small apartment near the beach.	101 Maple St	Kota Kinabalu	90	Reserved
500	9005	Villa	5	Luxury villa with private pool.	202 Oak St	Kuching	300	Available

Review:

1 SELECT *

2 FROM Review

3

Results	Explain	Describe	Saved SQL	History			
	REVIEWID	GUESTID	BOOKINGID	REVIEWDATE	RATING	COMMENTS	
3301		1	1	03/04/2024	4	Great place, would stay again.	
3302		1	2	05/27/2024	5	Perfect stay, highly recommend!	
3303		1	3	04/26/2024	3	Average experience, not as expected.	
3305		2	4	08/16/2021	5	Amazing villa, worth every penny!	
3306		2	5	09/26/2021	2	Not satisfied with the cleanliness.	

Payment:

1	SELECT *
2	FROM Payment
3	
▶	

	PAYMENTID	BOOKINGID	PAYMENTDATE	PAYMENTMETHOD
6001		1	01/09/2024	Credit Card
6002		2	05/15/2024	Bank Transfer
6003		3	03/29/2024	Credit Card
6004		4	07/28/2021	PayPal
6005		5	09/10/2021	PayPal

Booking:

1	SELECT *
2	FROM Booking
3	

	BOOKINGID	PROPERTYID	GUESTID	CHECKINDATE	CHECKOUTDATE	BOOKINGSTATUS
1		200	1	01/11/2024	01/15/2024	Confirmed
2		300	1	05/18/2024	05/25/2024	Confirmed
3		400	1	04/01/2024	04/05/2024	Confirmed
4		600	2	08/01/2021	08/05/2021	Confirmed
5		700	2	09/13/2021	09/17/2021	Confirmed

Facility:

1SELECT *

2FROM Facility

3

Results

Explain

Describe

Saved SQL

History

FACILITYID	NAME	OPENINGHOURS	CLOSINGHOURS	RULES
5001	Swimming Pool	08:00	20:00	No diving allowed.
5002	Gym	06:00	22:00	No food or drink.
5003	Spa	09:00	21:00	By appointment only.
5004	Sauna	10:00	20:00	Limit of 15 minutes.
5005	Conference Room	08:00	18:00	Reservation required.

Property Facility:

1

SELECT *

2

FROM PropertyFacility

3

Results

Explain

Describe

Saved SQL

History

	PROPERTYID	FACILITYID
100	5001	
100	5002	
200	5003	
300	5005	
300	5006	

Part 4: Query a database (each sub-part carries 4 marks; max of 20 marks)

Query Description																																		
a.	To evaluate customer satisfaction for the year 2023 and 2024, DreamHaven aims to analyse feedback from guests who rated their stays poorly in 2023 and 2024. The goal is to identify the properties priced under \$100 per night that have received low ratings. By examining this data, DreamHaven hopes to address potential issues associated with lower-priced properties and enhance overall customer satisfaction. To achieve this, they need to review the feedback left by guests who provided ratings lower than 3.																																	
<pre>Select r.guestID, r.bookingID, r.rating, r.comments, EXTRACT(YEAR FROM r.ReviewDate) AS ReviewYear FROM Review r WHERE r.Rating < 3 AND EXTRACT(YEAR FROM r.ReviewDate) in (2023,2024) AND r.bookingID IN (SELECT b.bookingID FROM Booking b WHERE b.propertyID IN (SELECT p.propertyID FROM Property p WHERE p.pricePerNight < 100)) ORDER BY EXTRACT(YEAR FROM r.ReviewDate), rating ;</pre>																																		
Results:																																		
<table><tr><th>GUESTID</th><th>BOOKINGID</th><th>RATING</th><th>COMMENTS</th><th>REVIEWYEAR</th></tr><tr><td>9</td><td>32</td><td>1</td><td>Found a cockroach in the bathroom</td><td>2023</td></tr><tr><td>16</td><td>51</td><td>1</td><td>Rooms and toilets were not clean</td><td>2023</td></tr><tr><td>15</td><td>48</td><td>2</td><td>Price reflects the poor quality.</td><td>2023</td></tr><tr><td>4</td><td>13</td><td>2</td><td>Disappointing experience.</td><td>2024</td></tr><tr><td>13</td><td>42</td><td>2</td><td>Rooms misleading as they were not as described</td><td>2024</td></tr></table>					GUESTID	BOOKINGID	RATING	COMMENTS	REVIEWYEAR	9	32	1	Found a cockroach in the bathroom	2023	16	51	1	Rooms and toilets were not clean	2023	15	48	2	Price reflects the poor quality.	2023	4	13	2	Disappointing experience.	2024	13	42	2	Rooms misleading as they were not as described	2024
GUESTID	BOOKINGID	RATING	COMMENTS	REVIEWYEAR																														
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15	48	2	Price reflects the poor quality.	2023																														
4	13	2	Disappointing experience.	2024																														
13	42	2	Rooms misleading as they were not as described	2024																														
5 rows returned in 0.02 seconds Download																																		

b. DreamHaven aims to evaluate their most popular properties and analyse which properties and hosts significantly contribute to their business. To achieve this, they need to identify the property ID and its address (street and state), the host ID and name, the number of bookings made, ratings, and total revenues of each property. DreamHaven has established some specific criteria for this evaluation where the number of bookings must be more than 3 and the average rating must be greater than 3.5. The results should be sorted by average rating in descending order to have a clear evaluation of the most popular properties.

```
SELECT p.PropertyID, p.Street, p.State, h.HostID, h.Name "Host Name", COUNT(b.BookingID) "Total Bookings",
ROUND(AVG(r.Rating), 2) "Average Rating", SUM(p.PricePerNight * (b.CheckOutDate - b.CheckInDate)) "Total Revenue"
from property p, host h, payment pm, booking b, review r
where h.HostID = p.HostID
and b.BookingID = pm.BookingID
and b.PropertyID = p.PropertyID
and r.BookingID = b.BookingID
group by p.PropertyID, p.Street, p.State, h.HostID, h.Name
having COUNT(b.BookingID) > 3
and AVG(r.Rating) > 3.5
order by ROUND(AVG(r.Rating), 2) DESC
```

Results:

PROPERTYID	STREET	STATE	HOSTID	Host Name	Total Bookings	Average Rating	Total Revenue
800	505 Walnut St	Malacca	9008	Natalie Green	4	4.25	1650
300	789 Pine St	Langkawi	9003	Emily Davis	4	4.25	4600
400	101 Maple St	Kota Kinabalu	9004	Grace Miller	4	4	1710
1000	707 Ash St	Langkawi	9010	Pamela Young	4	3.75	7000

c. DreamHaven is having a host mentorship program. They want to pair experienced hosts (joined before 2023) with new hosts (joined in 2023 or later) who manage similar-themed properties in the same state. This ensures relevant, state-specific guidance, while also comparing pricing between experienced and new hosts to highlight competitive strategies and enhance property appeal.

SELECT

```
h1.Name AS Experienced_Host,
p1.PropertyID AS EH_Property_ID,
h2.Name AS New_Host,
p2.PropertyID AS NH_Property_ID,
p1.PropertyType AS Property_Type,
p1.State,
p1.PricePerNight AS EH_Price_per_night,
p2.PricePerNight AS NH_Price_per_night
FROM Host h1
INNER JOIN Property p1 ON h1.HostID = p1.HostID
INNER JOIN Host h2 ON h1.HostID < h2.HostID
INNER JOIN Property p2 ON h2.HostID = p2.HostID
WHERE h1.JoinDate < TO_DATE('2023-01-01', 'YYYY-MM-DD')
AND h2.JoinDate >= TO_DATE('2023-01-01', 'YYYY-MM-DD')
AND p1.State = p2.State
AND p1.PropertyType = p2.PropertyType
AND p1.Description LIKE '%theme%';
```

Results:

EXPERIENCED_HOST	EH_PROPERTY_ID	NEW_HOST	NH_PROPERTY_ID	PROPERTY_TYPE	STATE	EH_PRICE_PER_NIGHT	NH_PRICE_PER_NIGHT
Alice Johnson	100	Natalie Green	800	Apartment	Malacca	100	110
Carol Brown	200	Zachary King	2000	House	Kuala Lumpur	150	125
Emily Davis	300	Oliver Scott	900	Condo	Langkawi	200	130
Emily Davis	300	Samuel Martin	1300	Condo	Langkawi	200	95
Tina Walker	1400	Xander Taylor	1800	Villa	Penang	350	275

5 rows returned in 0.05 seconds [Download](#)

e. Provide a list of Airbnb customers who have made at least 3 bookings within a year with total sum paid of more than \$3000.

```
SELECT G.GuestID, G.Name, COUNT(B.BookingID) AS BookingCount, SUM(P.PricePerNight * (B.CheckOutDate - B.CheckInDate)) AS
TotalPaid
FROM GUEST G
INNER JOIN BOOKING B ON G.GuestID = B.GuestID
INNER JOIN PROPERTY P ON B.PropertyID = P.PropertyID
WHERE TO_CHAR(B.CheckInDate, 'YYYY') = TO_CHAR(B.CheckOutDate, 'YYYY')
GROUP BY G.GuestID, G.Name
HAVING COUNT(B.BookingID) >= 3 AND SUM(P.PricePerNight * (B.CheckOutDate - B.CheckInDate)) > 3000
ORDER BY g.guestid, g.name
```

Results:

GUESTID	NAME	BOOKINGCOUNT	TOTALPAID
3	Frank Harris	3	3340
4	Hannah Moore	4	4635
6	Laura Jackson	5	3570
20	Laura Johnson	3	3960

Part 5: Teamwork and Presentation (20 marks)

List each student's presentation here. Please update the following table accordingly.

No	ID	Name (temporary)	Questions to present
i)	22034540	Wong Hui San	Introduction Explain ERD & business rules Run SQL code for question c)
ii)	23109614	Keertana A/P Subramaniam	Explain RDM & various keys in each table (including alternate key) Run SQL code for question d) & question e)
iii)	22017867	Ayu Wen Li	Explain Constraint Running batch script Run SQL code for question a)
iv)	22053037	Siow Qi Yung	Explain Index Run SQL code for question b)