Learning Outcomes:

- Apply redundancy control in designing a database.
- Demonstrate a database solution using an appropriate tool based on a case study.

Case Study:

***Umbrella Corporation* Rental Management System**

- In view of the growing demand for property rentals, the *Umbrella Corporation* Company is planning to establish a property rental management system. The management system will be able to maintain data that is used and generated to support the property rentals business for their clients and property owners. Your team is assigned the project to design a database system to support the *Umbrella Corporation* Rental Management System.

Scenario:

- *Umbrella Corporation* has a branch office in each state throughout Malaysia. Each branch office is allocated employees. The data describing the branch office includes a unique branch number, address (street, city, and postcode), and telephone numbers (up to a maximum of three).
- Employees with the role of Supervisor are responsible for an allocated group of employees called Assistants (up to a maximum of 3, at any one time). Not all employees are assigned to a Supervisor. The data stored regarding each employee includes employee id, name, address, position, salary, the assigned Supervisor (where applicable), and the details of the branch office at which the employee is currently working. The employee number is unique across all branches of *Umbrella Corporation*.
- Each branch office offers a range of properties for rent. The data stored for each property includes property id, address (street, city, and postcode), type, number of rooms, monthly rent, and the details of the property owner. The property number is unique across all branch offices. The management of a property is assigned to an employee whenever it is rented out or requires to be rented out. An employee may manage a maximum of 10 properties for rent at any one time. Currently, the *Umbrella Corporation* Company is managing 30 properties.
- The details of property owner are also stored. There are two main types of property owner: private owners and business owners. The data stored for private owners includes owner id, name, address, telephone number, email, and password. The data stored on business owners includes name of business, type of business, address, telephone number, email, password, and contact name. The password will allow owners access to parts of the *Umbrella Corporation* database using the Web. Currently, there are 12 private owners and 13 business owners that have registered with *Umbrella Corporation* Company.
- *Umbrella Corporation* refers to members of the public interested in renting property as clients. To become a client, a person must first register at a branch office of *Umbrella Corporation*. The data stored on clients includes client id, name, telephone number, email, preferred type of accommodation, and the maximum rent that the client is preferred to pay. Also recorded is the details of the employee who processed the registration, the date the client joined, and some details on the branch office at which the client registered. The client id is unique across all *Umbrella Corporation* branches. Currently, there are 20 clients that have registered with *Umbrella Corporation* Company.

- When a property is rented out, a lease is drawn up between the client and the property. That data listed in detail on the lease includes lease number, client number, name and address, property number and address, monthly rent, method of payment, an indication of whether the deposit has been paid (calculated as twice the monthly rent), duration of lease, and the start and end dates of the lease period. Currently, there are 30 leases that have been recorded between *Umbrella Corporation*'s clients and its properties.

Coursework Details:

1. In this assignment, you are required to design, implement, and document a database system for *Umbrella Corporation* Rental Management System.

2. Create the following queries using Data Manipulation Language (DML) – Each student must be able to explain the queries and justify the approach taken.

Student 1

1. List the name, position, and salary of employees' branch *BR08*, and arrange the list alphabetically according to the names.
2. List the details of employees who work at branch that is based in *Johor* state.
3. List the type of the property and the business owner's name, for all property in which the property type is *Bungalow* with number of rooms that is more than 5.

Student 2

1. Find the highest salary of *Assistants*.
2. List the preferred type of property for clients whose name starts with the letter *S*.
3. List the name, phone, and city of the registered branch for clients whose preferred accommodation type is *Condominium*.

Student 3

1. Find the average salary of employees whose position is an *Supervisor*.
2. List the method of payment for each lease where the property's type is *Apartment* and the monthly rent is more than *500*.
3. List the name of employees and their branch's address for employees whose salary is neither *2,800* nor *3,500*.

Student 4

1. Find the total number of employees working in each branch.
2. List the employee details who has registered their clients, in which the client's preferred maximum rent to pay is within the range of *100* and *900*.
3. List the lease's start date, end date, duration, method of payment, and the client's name where the client's preferred maximum rent to pay is *700*.

3. Deliverables :

Part	Component
1	a) Database and Database Management System • Disadvantages of file-based system • Advantages of Database and DBMS • Relate your discussion to the case study
1	b) Business Rules & Normalization • Generate a list of business rules • Provide an example of UNF and perform normalization up to 3NF clearly showing all the steps with explanation
1	c) Entity Relationship Diagram • Design the database using Chen's or Crow's foot notation • Draw the ERD with any suitable tools such as Visio • All entities, attributes, relationship and constraints should be clearly shown
1	d) Workload Matrix of each team member for Part 1 of the assignment (a copy of this will also need to be submitted via MS Teams)
2	e) Database Schema • Finalized ERD • Map the ERD to its corresponding relational schema and normalise all relations up 3NF • Identify the attributes, data types and constraints of each tables and document in data dictionary. • Generate the database diagram from the DBMS
2	f) SQL-Data Definition Language (DDL) • Create all tables with suitable data types • Insert 5-10 rows of data into each table • Screen shot all query statements • Screen shot all tables with its data

2	g) SQL-Data Manipulation Language (DML) • Write SQL statements to answer question (2) above • Screen shot all query statements together with its executed result
2	h) Workload Matrix of each team member for Part 2 of the assignment (a copy of this will also need to be submitted via MS Teams)

General Requirements:

In this assignment you are required to:

- Work a group of 3 members.
- Design and implement a solution to a business problem.
- Implement the solution using any Enterprise DBMS.
- Document the solution as set out in the assignment requirements.
- Submit the document online according to the date and time given below.
- Submit a Workload Matrix given by lecturer through MS TEAMS.
- Each group member is required to participate in all tasks / discussions together.
- Presentation schedules will be published at a later date through MS TEAMS.

Note: It is acceptable for discrete activities of this assignment to be undertaken by individual group members. However, it is essential that all group members understand the presentation in its entirety. At the end of the demonstration your group will be asked a series of questions to explore your understanding and analysis of the given problem. Responses to these questions such as "I don't know because I didn't work on that part of the assignment" are not acceptable and will result in a penalty for either the entire group or specific individual(s).

Part	Assessment Criteria:	Marks Allocation	Online Submission Date
1	**Group Component (40%)** a) Database and Database Management System b) Business Rules & Normalization c) Entity Relationship Diagram	 8% 12% 20%	**Week 8**
2	**Group Component (18%)** d) Database Schema **Individual Component (42%)** e) SQL-Data Definition Language (DDL) f) SQL-Data Manipulation Language (DML)	 18% 12% 30%	**Week 13**