POLITEKNIK MALAYSIA

NILAI

DATABASE MANAGEMENT SYSTEM

Workbook

NURUL FADHLUN AWANG

AZALINDA MAT SAAD

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Workbook

GUIDED FOR STUDENTS OF POLITEKNIK MALAYSIA

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PENERBIT
POLITEKNIK NILAI
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In the name of Allah, the Most Gracious, the Most Merciful.

First and foremost, we would like to express our deepest gratitude to Allah for granting us the strength, perseverance, and inspiration to complete this Database Management System Workbook. Without His guidance and blessings, this journey would not have been possible.

We extend our heartfelt thanks to our families for their unwavering moral support, encouragement, and understanding throughout the process of writing this workbook. Their patience and love gave us the motivation to continue, and we are truly blessed to have them by our side.

We would also like to express our appreciation to Politeknik Nilai for providing the foundation and resources through its syllabus, which guided the structure of this workbook. It is our hope that this workbook will serve as a valuable tool for both students and educators in enhancing the teaching and learning experience.

To everyone who has contributed, directly or indirectly, to the completion of this project, we offer our sincere thanks. May this effort benefit many in the pursuit of knowledge.

Nurul Fadhlun Awang & Azalinda Mat Saad

PREFACE

Welcome to the Database Management System Workbook! This workbook is designed to serve as an essential companion for students and professionals who are looking to deepen their understanding of database management systems. With its concise notes and a wealth of practical exercises, this book aims to bridge the gap between theoretical knowledge and hands-on experience.

Each chapter provides quick, digestible notes that summarize key concepts, followed by a wide range of questions and exercises. These materials are specifically curated to reinforce the lessons learned during class lectures, allowing for an engaging and interactive learning experience. Whether you're a student preparing for exams or an instructor seeking a robust classroom resource, this workbook offers the tools you need to develop a solid foundation in database management.

We hope that as you navigate through the exercises, you not only master the skills of database design and management but also foster a passion for problem-solving in the dynamic world of databases.

Happy learning!

ABSTRACT

The Database Management System Workbook is a practical and instructional guide designed to support learners in mastering the foundational concepts of database management. This workbook offers quick notes for each chapter, providing concise yet comprehensive overviews of essential topics, from database design and data modeling to SQL queries and transaction management.

In addition to these notes, the workbook contains a variety of exercises and questions aimed at enhancing the student's practical skills and application of knowledge. These exercises are crafted to encourage active participation during lectures, making this book an invaluable learning aid for both classroom use and individual study.

The workbook is structured to promote interactive learning, offering students the opportunity to apply theoretical concepts through hands-on practice, thus bridging the gap between theory and application. It is an ideal resource for anyone seeking to develop a solid understanding of database management systems, whether in an academic setting or in professional development.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION TO DATABASE SYSTEM

QUICK NOTES

WHAT IS DATABASE?

A database is a **systematic or organized collection of related information** that is stored electronically so that it can be easily **accessed, retrieved, managed, and updated by multiple users.**

DATA VS INFORMATION

Data is **raw, unorganized facts** that has **no specific meaning** until it is processed.

VS

Information is data that is **processed, organized, and structured.**

WHAT IS DATABASE MANAGEMENT SYSTEM (DBMS)?

A Database Management System (DBMS) is **software** that facilitates the **creation, organization, storage, retrieval, modification, and management of databases.** It acts as an **intermediary between the user and the database,** providing an interface for users and applications to interact with the data stored in the database.

WHAT IS BIG DATA?

Big data refers to **large and complex datasets** that are **difficult to manage, process, and analyze using traditional data processing tools and methods.**

EXERCISE

ANSWER ALL QUESTIONS BELOW

State THREE (3) differences between data and information

Data	Information

Identify which of the statement below is data and which is information

Statement	Data/ Information
Number of students in class	
Data from questionnaires	
Report on distribution of computers in a school	
Price of a burger	
Numbers of website visitor in a month	
Sales report	
Summary on students' performance in class	

EXERCISE

Define data collection.

List FIVE (5) data collections methods

Explain FIVE (5) data collections methods.

Explain THREE (3) purpose of database management system.

EXERCISE

State three-schema architecture of database.

Explain three-schema architecture of database.

Define big data.

Discuss THREE (3) characteristics of big data.

CHAPTER 2

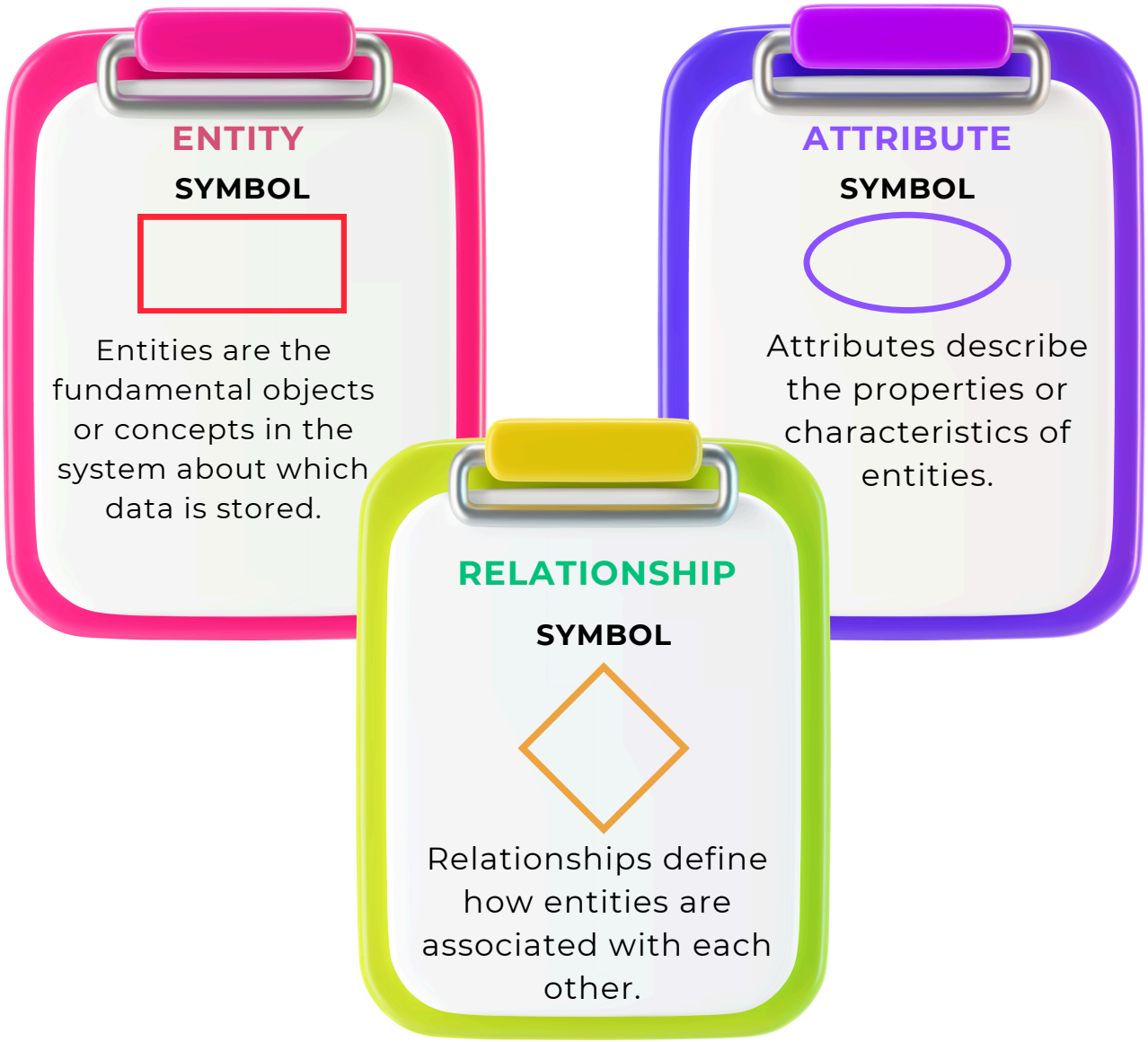
DATA MODELING

QUICK NOTES

WHAT IS AN ENTITY RELATIONSHIP DIAGRAM (ERD)?

The ERD is a diagram that displays the **relationship of entity sets** stored in a database. ERDs are commonly used during the **design phase** of database development to **visualize** and understand the structure of the data model. ERDs are created based on three basic concept; **entities, attributes and relationships.**

COMPONENTS OF ERD



EXERCISE

ANSWER ALL QUESTIONS BELOW

Draw the symbols and describe each of the term below:

Term	Symbol	Description
Entity		
Relations		
Attribute		
Link		
Weak Entity		
Multivalued attribute		

State THREE (3) examples of entities.

Give FOUR (4) examples of attributes for each of the entity below.

Entity	Examples
Artist	
Order	
Product	

QUICK NOTES

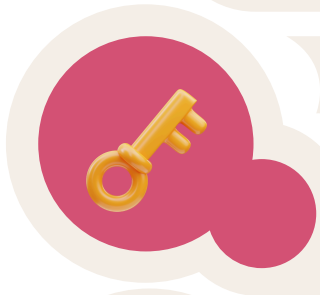
WHAT IS DATABASE KEY?

A database key is a **field or set of fields** within a database table that **uniquely identifies each record (row)** in that table. Keys are essential for maintaining **data integrity, enforcing constraints, and facilitating efficient data retrieval and manipulation** within a database management system (DBMS).

TYPES OF DATABASE KEY

PRIMARY KEY (PK)

A primary key is a **unique identifier** for each record in a table. It **uniquely identifies each row** and ensures that there are no duplicate records. The primary key **cannot contain NULL values.**



FOREIGN KEY (FK)

A foreign key is **a field or a combination of fields** in **one table** that **refers to the primary key in another table.** It **establishes a relationship between the two tables**, enforcing referential integrity.

CANDIDATE KEY

A candidate key is **a set of one or more attributes (columns)** within a relation (table) that **uniquely identifies each tuple (row)** in that relation. Candidate keys are **potential choices for the primary key** of a table.

COMPOSITE KEY

A composite key is a key that consists of **two or more columns** in a table. Together, **these columns uniquely identify each row** in the table. While **each individual column may not be unique by itself.**

ALTERNATE KEY

An alternate key is a **candidate key** that is **not selected as the primary key**. It could be another unique key within the table that can be used to uniquely identify rows.

EXERCISE

ANSWER ALL QUESTIONS BELOW

Define all the terms below.

Key	Definition
Primary Key	
Foreign Key	
Candidate Key	
Alternate Key	
Composite Key	

State FIVE (5) examples of attributes that suitable to be a Primary Key

What are the characteristics of Primary Key?

Given the following tables, identify the primary key for each table:

Table	Attributes	Primary Key
Student	StudentID, Name, Age, Major	
Table	ISBN, Title, Author, Genre, PublishYear	
Order	OrderID, CustomerID, Date, TotalAmount	
Employee	EmployeeID, FirstName, LastName, Email	

EXERCISE

Based on the table below, state a suitable entity name and TWO (2) attributes.

Cust_id	Cust_name	Address	Sales_Rep_No
C021	Danny	18, Jln Mangga	S110
C123	Anita	65, Jln 11/7	S0099
C007	Salman	7, Jln. Simpang	S022
C432	Halim	1, Setia 1/23	S043

Based on the tables below, state Primary Key and Foreign Key.

Table: Store

Store_ Key	City	Region
1	Besut	Timur
2	Kangar	Utara
3	Skudai	Selatan

Table: Product

Product_ Key	Description	Brand
1	Paskal	AstoShaw
2	Boboiboy 2	AnimeStudio
3	Munafik	SKOP Production

Table: Sales

Store_Key	Product_Key	Sales
1	2	1.2
1	2	1.5
1	3	1.8

QUICK NOTES

WHAT IS CARDINALITY?

A cardinality refers to the **relationship between tables,** specifically describing the **number of instances of one entity** that **can be associated** with **the number of instances of another entity.** It helps to define the nature and extent of relationships between tables.

TYPES OF CARDINALITY

ONE-TO-ONE (1:1)

This cardinality indicates that **each record** in one table **corresponds to exactly one record** in another table, **and vice versa.**

ONE-TO-MANY (1:N)

This cardinality indicates **each record** in one table can be associated with **one or more records** in another table, but **each record in the second table** is associated with **only one record in the first table.**

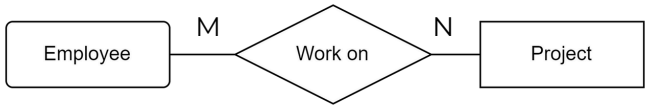
MANY-TO-MANY (M:N)

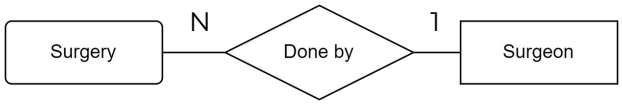
This cardinality indicates **each record** in one table can be associated with **one or more records** in another table, **and vice versa.** This relationship requires the use of a junction (or link) table to connect the two entities.

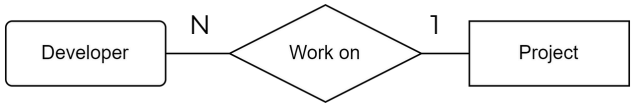
EXERCISE

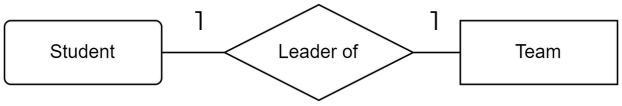
ANSWER ALL QUESTIONS BELOW

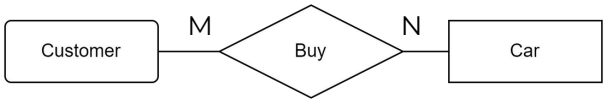
Write the cardinality for each diagram









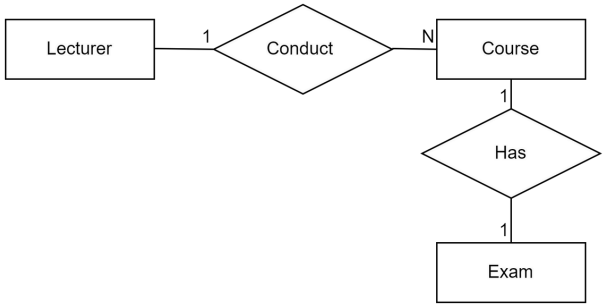


EXERCISE

Create an ERD with cardinality for each of the following situation.

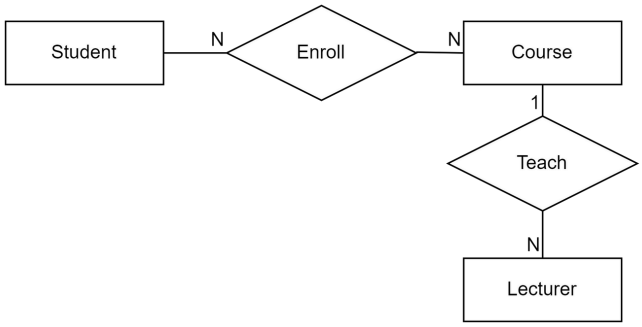
	SITUATION	SQL STATEMENT
a.	A students have to opt for a single course, but a course can have many students.	
b.	A customer can place many orders, but an order cannot be placed by many customers.	
c.	A student has only one identification card and an identification card is given to one person.	
d.	An employee can be assigned to many projects and a project can have many employees.	
e.	A professor teaches many classes. A class is taught by a single professor.	
f.	A student enrolls in many classes. A class has many students	

Interpret the type of relationship between Lecturer - Course and Course - Exam



EXERCISE

Interpret the type of relationship between Lecturer - Course and Course - Exam



Draw an ERD of the data model described by the business rules below. Make sure the ERD has entities, attributes and cardinalities.

- **A Hospital Management System consists of four entities that are Doctor, Patient, Ward, and Disease with identifying attributes for primary key that are Doc_Id, Patient_no, Ward_no and Disease_no.**
- **Doctor are described by Doc_name and Department, Patient by Patient_name and age, Ward by Ward_name and Disease by Disease_name and Price.**
- **Many doctors will treat numerous patients and each patient will have at least one or more diseases.**
- **A patient will only be assigned into one ward and only one doctor will handle a disease at a time.**

EXERCISE

Draw an ERD of the data model described by the business rules below. Make sure the ERD has entities, attributes and cardinalities.

- **One region can be the location for many stores. Each store is located in only one region.**
- **Each store employs one or more employees. Each employee is employed by one store.**
- **A job can be assigned to many employees. Each employee can have only one job assignment.**

Draw an ERD of the data model described by the business rules below. Make sure the ERD has entities, attributes and cardinalities.

- **A university consists of a number of departments. Each department offers several courses.**
- **A number of modules make up each course. Students enroll in a particular course and take modules towards the completion of that course.**
- **Each module is taught by a lecturer from the appropriate department, and each lecturer tutors a group of students.**

EXERCISE

Draw an ERD of the data model described by the business rules below. Make sure the ERD has entities, attributes and cardinalities.

- **For each reality show, its name, genre, basic_info and participants. Any reality show has at least two or more participants.**
- **For each producer, the company name, company country. A show is produced by exactly one producer. And one producer produces exactly one show.**
- **For each television, its name, start year, head office. A television may broadcast multiple shows. Each show is broadcasted by exactly one television.**
- **For each user, his/her username, password, and age. A user may rate multiple shows, and a show may be rated by multiple users.**

EXERCISE

Draw an ERD of the data model described by the business rules below. Make sure the ERD has entities, attributes and cardinalities.

- **A college contains many departments. Each department can offer any number of courses.**
- **Many instructors can work in a department. A department has many instructors.**
- **There is a head for each department. An instructor can be the head of only one department.**
- **each instructor can take any number of courses. A course can be taken by only one instructor.**
- **A student can enroll for any number of courses. Each course can have any number of students.**

EXERCISE

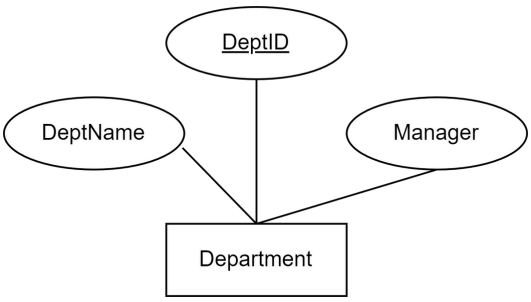
List THREE (3) degree of relationship.

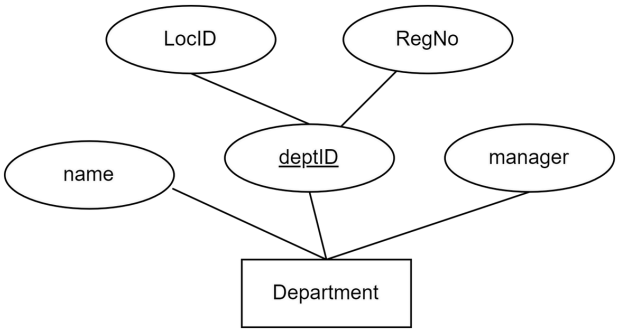
Explain and draw the diagram for each degree of relationship.

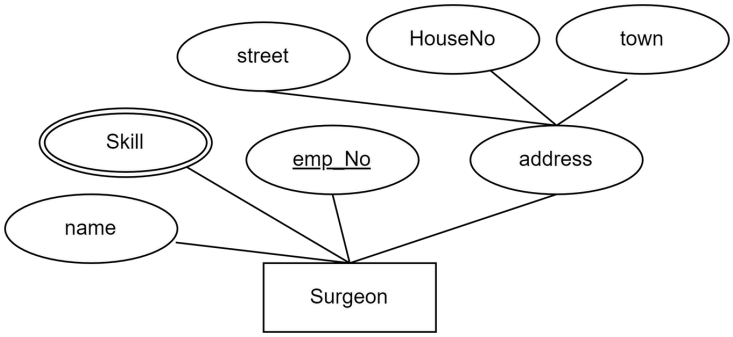
EXERCISE

Covert the ERD to relational model.

STRONG ENTITY



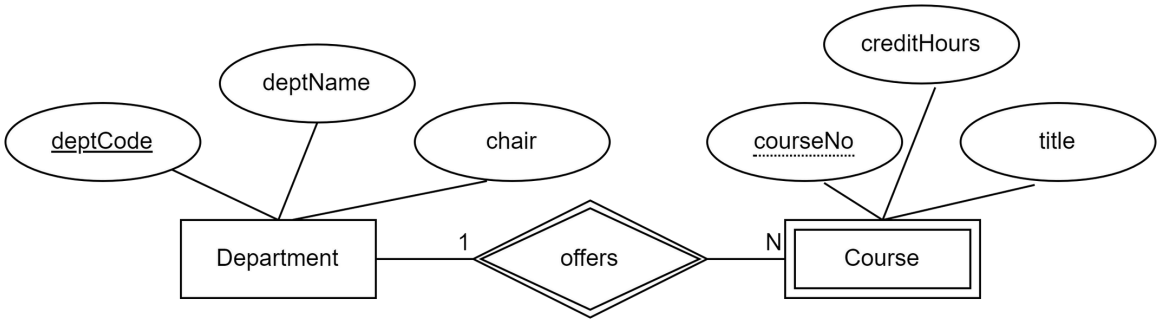


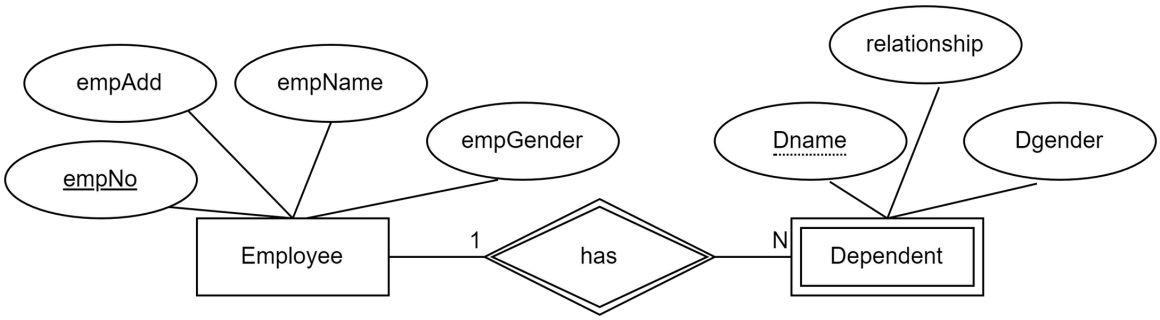


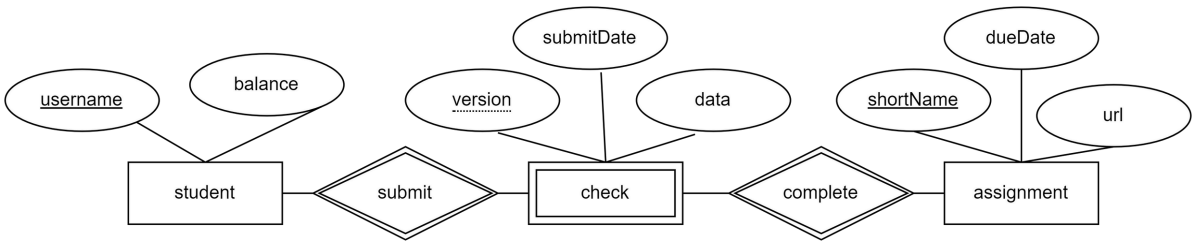
EXERCISE

Covert the ERD to relational model.

WEAK ENTITY



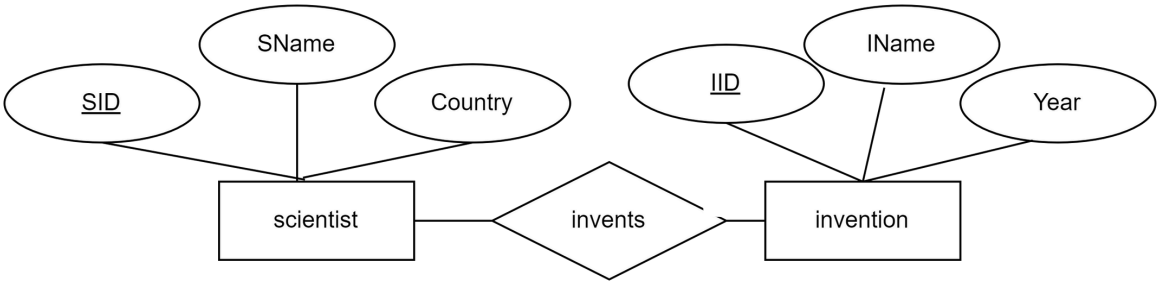


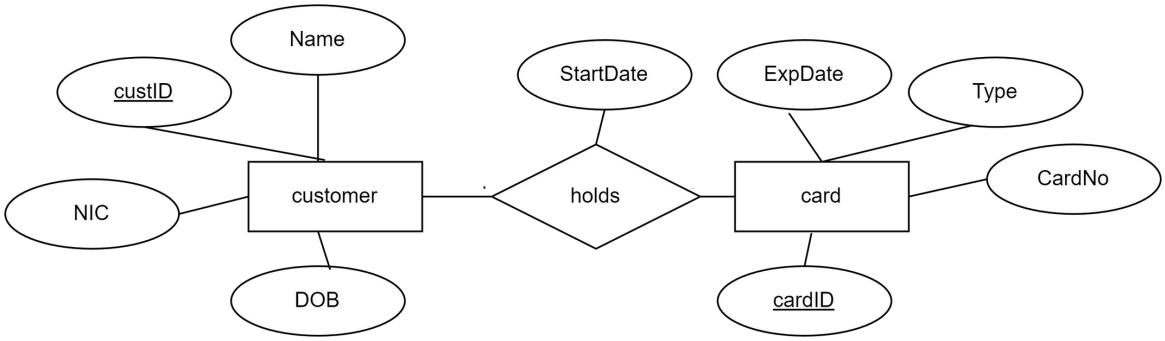


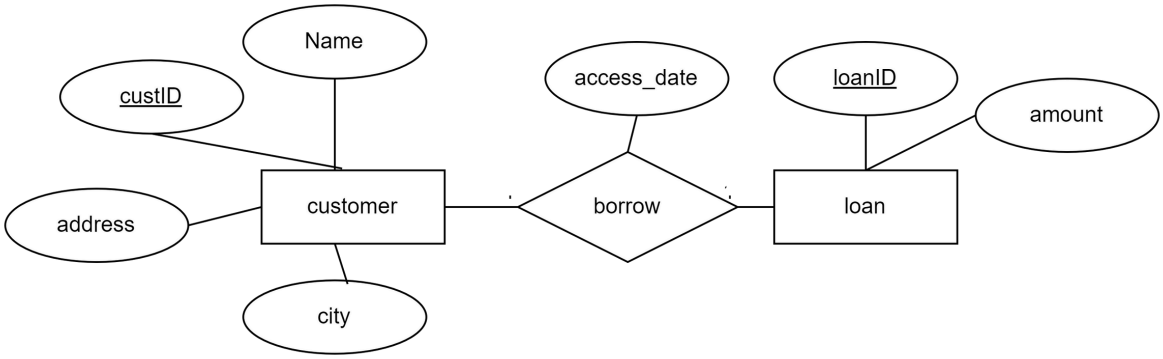
EXERCISE

Covert the ERD to relational model.

1:N RELATIONSHIP



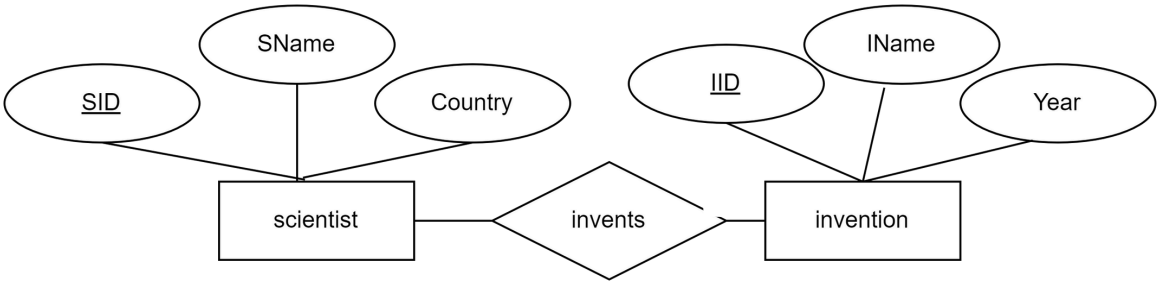


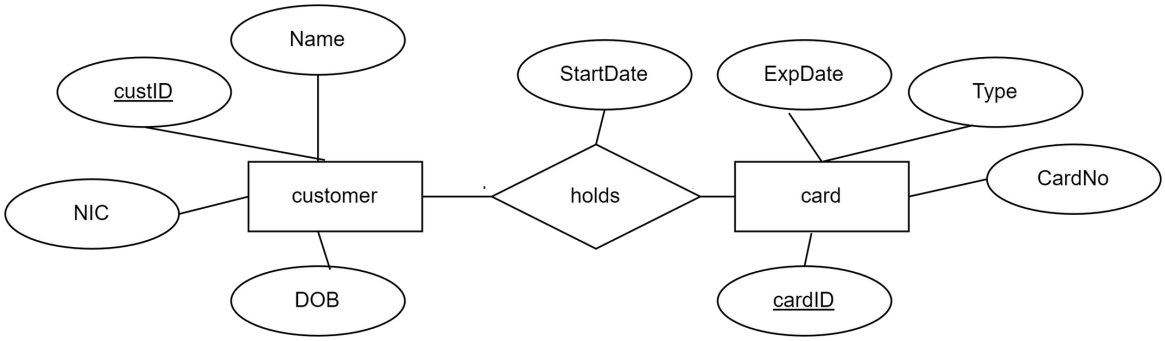


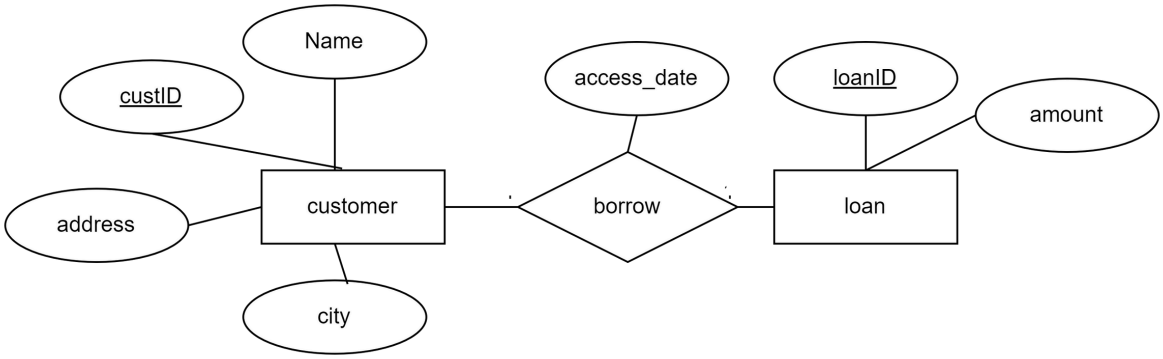
EXERCISE

Covert the ERD to relational model.

1:1 RELATIONSHIP



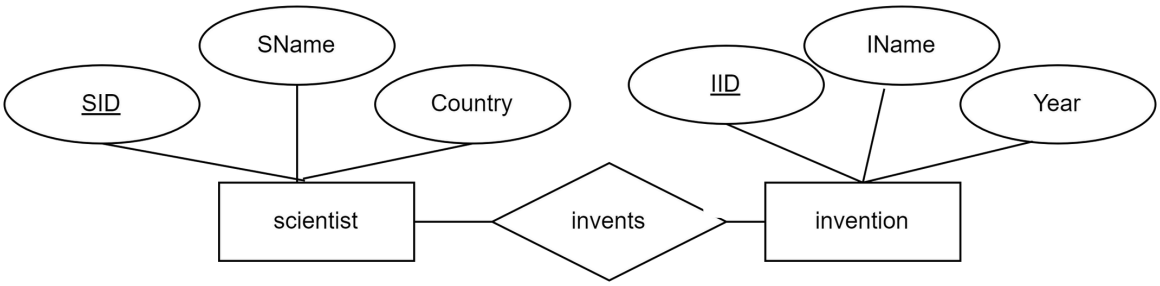


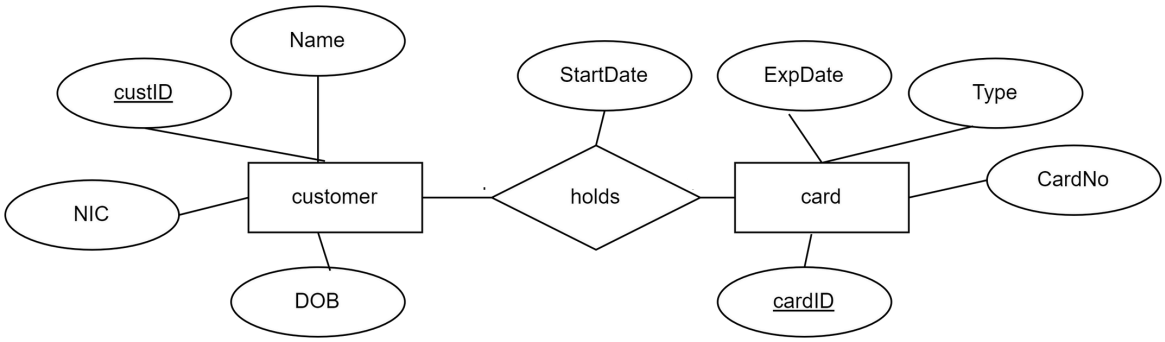


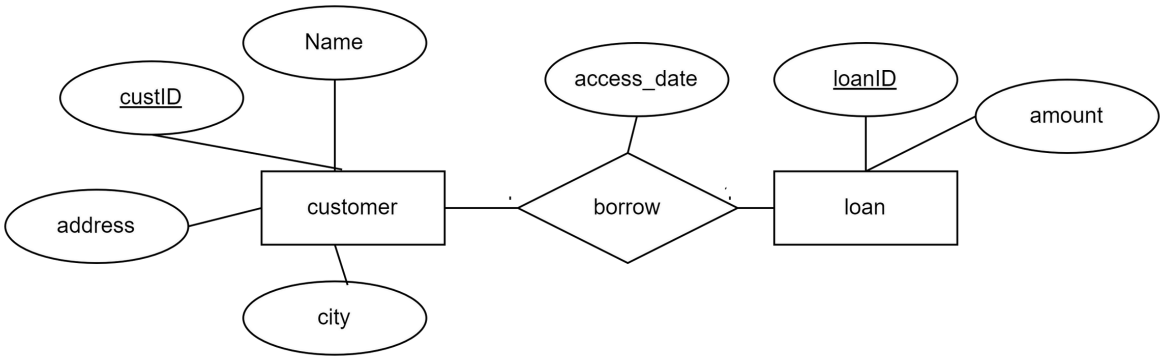
EXERCISE

Covert the ERD to relational model.

M:N RELATIONSHIP



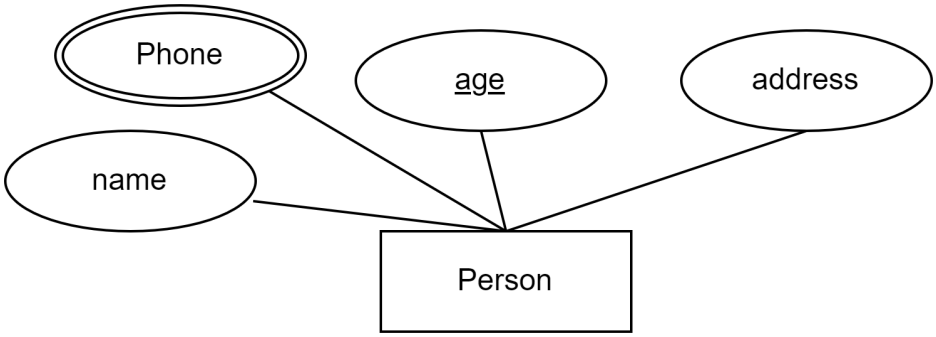


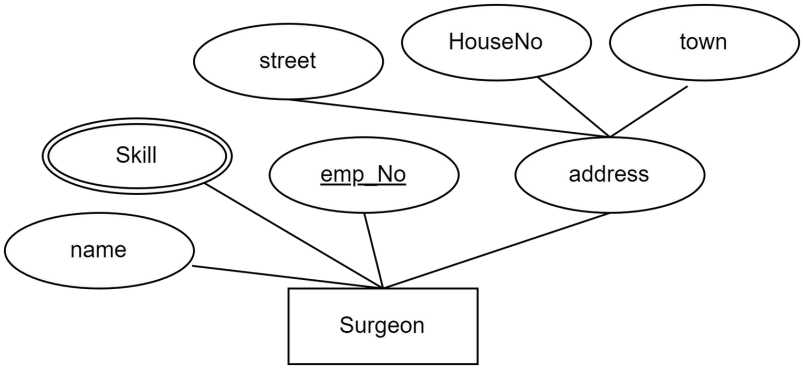


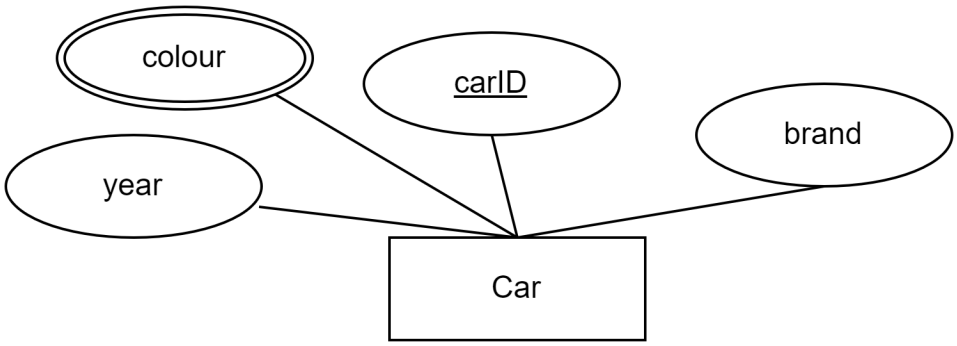
EXERCISE

Covert the ERD to relational model.

MULTIVALUED ATTRIBUTE



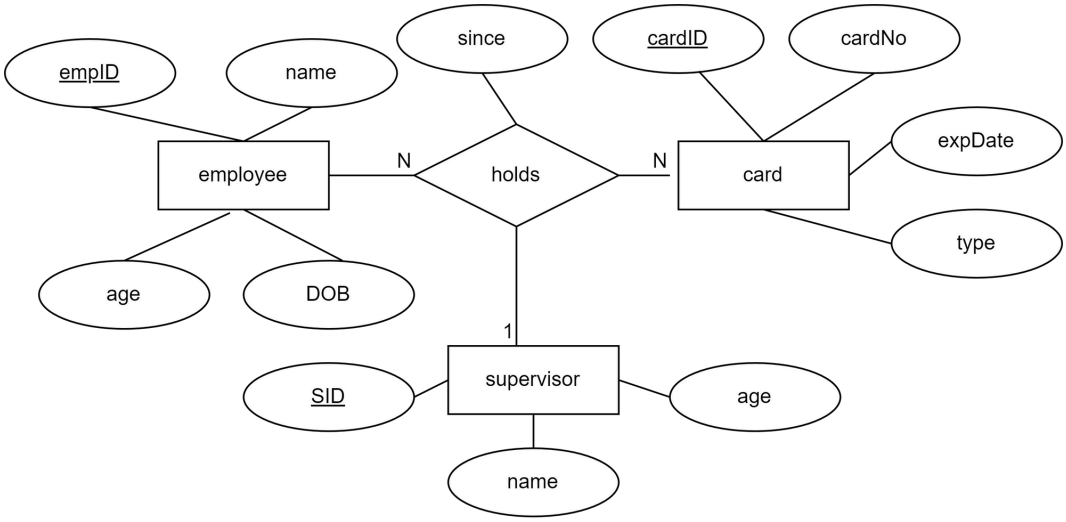


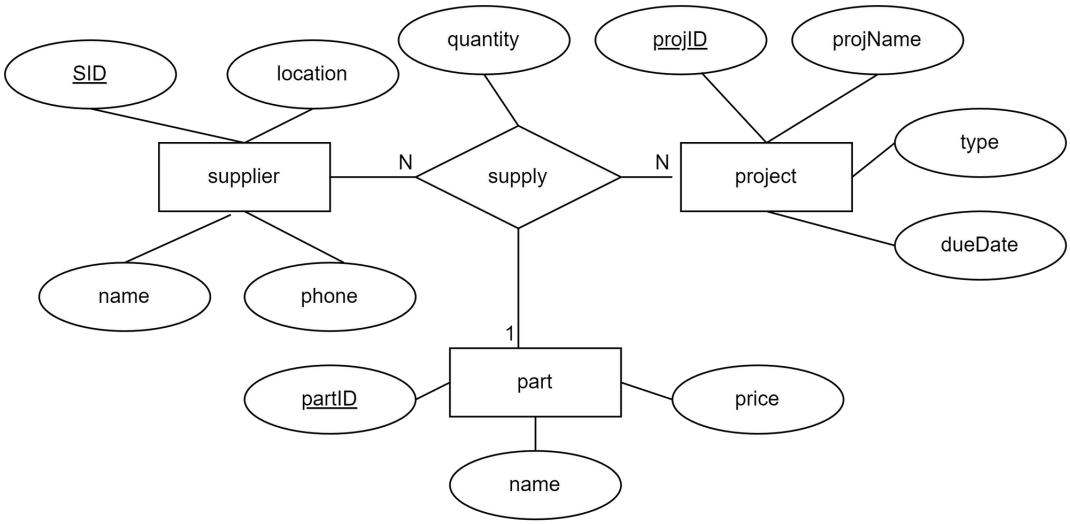


EXERCISE

Covert the ERD to relational model.

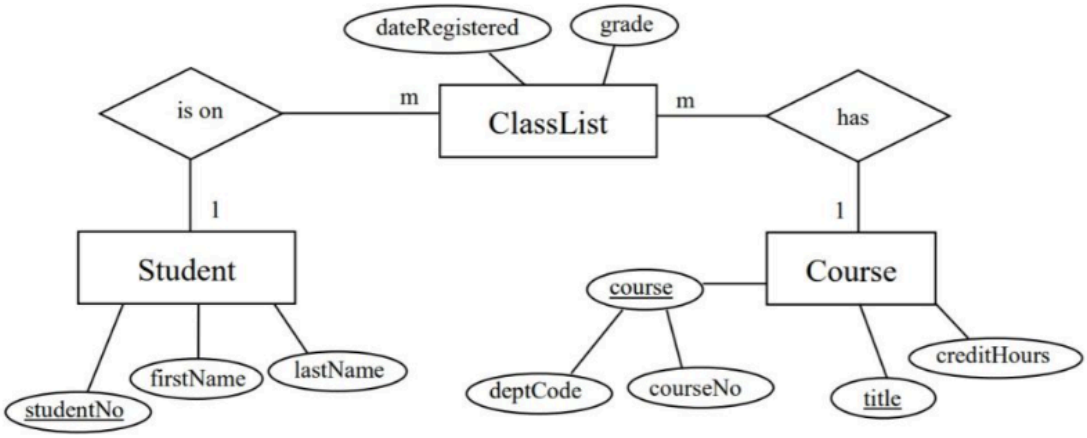
N-ary RELATIONSHIP





EXERCISE

Change ERD below into a relational model



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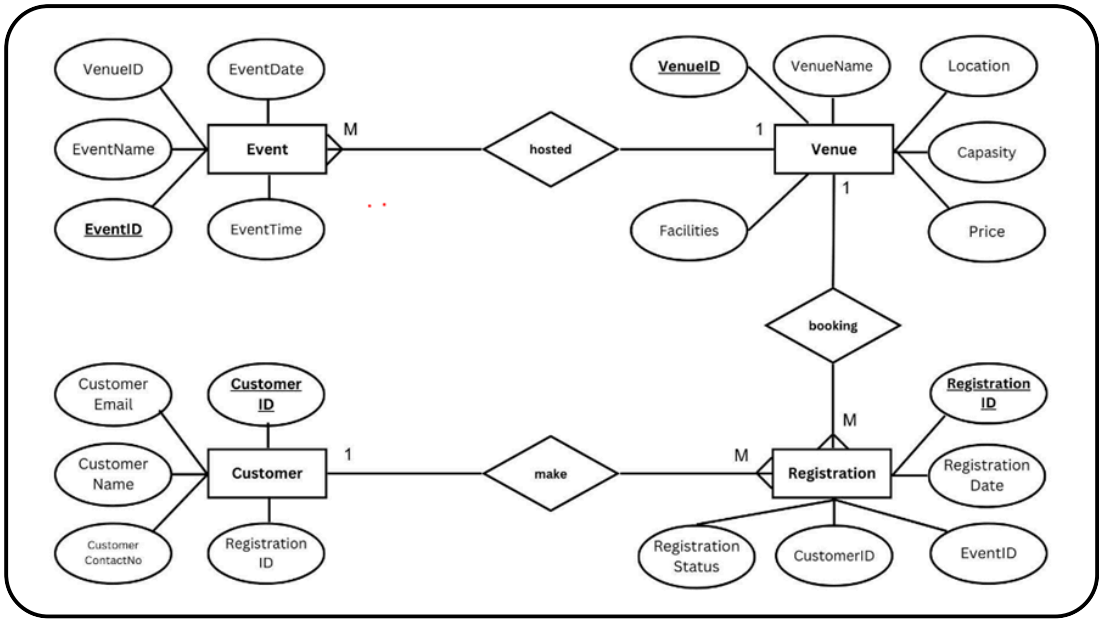


QUICK NOTES

WHAT IS DATABASE NORMALIZATION?

Database normalization is the **process of organizing the attributes and tables** of a relational database to **minimize redundancy and dependency.** The primary goal of normalization is **to eliminate data anomalies.**

TYPES OF DATA ANOMALIES

INSERTION ANOMALIES

The inability to add data to database due to the absent of some other data.

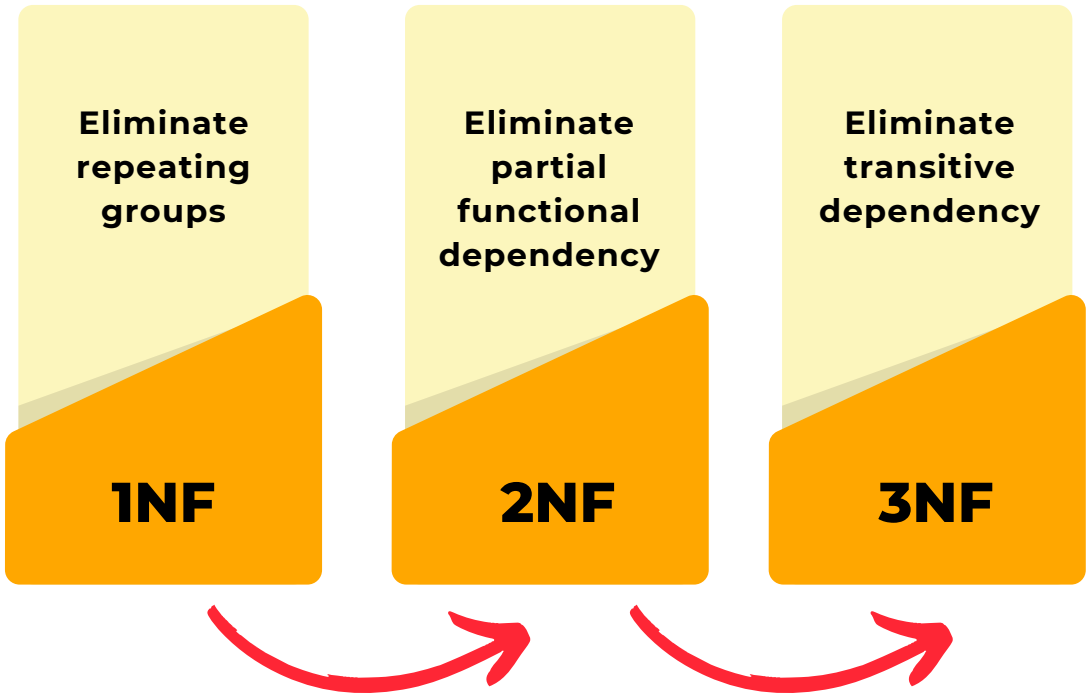
DELETION ANOMALIES

The unintended loss of data due to the deletion of some other data.

UPDATE ANOMALIES

The inconsistency of data due to the updating only some of the data.

DATABASE NORMALIZATION FORM



EXERCISE

ANSWER ALL QUESTIONS BELOW

Define database normalization.

Discuss THREE (3) importances of database niormalization.

List THREE (3) normalization form in database.

EXERCISE

CONVERT ALL THE FOLLOWING TABLES INTO 1NF

TABLE 1

Table: Employee

emp_id	emp_name	emp_address	emp_pos
1022	Hakim	Bidor	Manager
			HR Head Assist
1223	Ibrahim	Bidor	Sales Officer
1221	Hussain	Bidor	Sales Manager
			HR Manager
1322	Fadhil	Bidor	Marketing Director
			HR Head Assist

EXERCISE

TABLE 2

Table: Employee

emp_id	emp_name	emp_mobile	emp_skills
1	Reza	0132685555	Phyton, JavaScript
2	Harlina	0165442334	HTML, CSS, JavaScript
3	Suresh	0186675223	Java, Linux, C++

EXERCISE

TABLE 3

Table: Student

stud_name	stud_birth	course_id	course_name	grade
ali	1995	IS102	C++	70
		IS1205	Web Design	80
alisa	1995	IS202	Programming	80
		IS304	DB	79
		IS101	C++	85

EXERCISE

CONVERT ALL THE FOLLOWING TABLES INTO 2NF

TABLE 1

Table: Student

stud_no	course_no	course_fee
1	C1	1000
2	C2	1500
1	C4	2000
4	C3	1000
4	C1	1000
2	C5	2000

EXERCISE

TABLE 2

Table: Teacher

teacher_id	teach_sub	teacher_age
111	C++	40
112	OOP	43
111	DB	40
123	DW	42
123	ADB	42

EXERCISE

TABLE 3

Table: Student

stud_name	stud_birth	course_id	course_name	grade
ali	1995	IS102	C++	70
ali	1995	IS1205	Web Design	80
alisa	1995	IS202	Programming	80
alisa	1995	IS304	DB	79
alisa	1995	IS102	C++	85

EXERCISE

CONVERT ALL THE FOLLOWING TABLES INTO 3NF

TABLE 1

Table: Employee

emp_id	emp_name	emp_poscode	emp_state	emp_city
112	Yahya	47000	Sg. Buloh	Selangor
123	Zaki	66200	Ipoh	Perak
132	Sathia	45500	Kuantan	Pahang
122	Cynthia	47500	Klang	Selangor

EXERCISE

TABLE 2

Table: Book

book_id	genre_id	genre_type	book_price
1	1	Cooking	10
2	2	Travel	20
3	1	Entertainment	12
4	3	Cooking	15
5	2	Sport	12

EXERCISE

TABLE 3

Table: Employee

emp_id	name	department	manager
1	Johan	IT	Salman
2	Dayan	HR	Salman
3	Fuad	Management	Zakwan
4	Khalid	Sales	Karim

EXERCISE

ILLUSTRATE THE PROCESS OF NORMALIZING THE TABLE TO 3NF

TABLE 1

Table: Employee

eID	contractNo	workHours	eName	hotelNo	hotelLoc
113WD	C1024	16	Melisa	H25	Ampang
234XA	C1024	24	Said	H25	Ampang
712YD	C1025	28	Kumar	H4	Cheras
113WD	C1025	16	Melisa	H4	Cheras

An agency called InstantCover supplies part-time/temporary staff to hotels throughout Kuala Lumpur. The table shown above is the lists of the time spent by agency staff working at two hotels. The eID is unique for employee. Illustrate the process of normalizing the table to 3NF.

EXERCISE

TABLE 2

Table: Employee

Order_no	Order_date	Product_no	Product_desc	Qty
N1201	03-03-2024	P002	Instant coffee (20 cachets)	25
N1201	03-03-2024	P008	Mineral water (500 ml)	60
N1078	21-02-2024	P010	Orange Juice (1 litre)	10
N1078	21-02-2024	P008	Mineral water (500 ml)	24
N1078	21-02-2024	P005	Fresh milk (1 litre)	10
N1312	06-08-2024	P008	Mineral water (500 ml)	36

CHAPTER 3

STRUCTURED QUERY LANGUAGE (SQL)

QUICK NOTES

WHAT IS STRUCTURED QUERY LANGUAGE (SQL)?

The SQL is a language designed specifically for **communicating with database**. The data stored inside database can be **extracted, organized, managed, and manipulated** by **SQL commands which is known as "queries".**

FUNDAMENTAL COMPONENTS OF SQL

SQL IDENTIFIERS

DEFINITION

Identifiers are names given to various database objects, such as tables, columns, indexes, views, and more.

EXAMPLE

- Table name: Employees
- Column name: employee_id

SQL DATA TYPES

DEFINITION

Data types specify the type of data that a column can store

EXAMPLE

- Numeric Types: INTEGER, DECIMAL, FLOAT, etc.
- Character Types: CHAR, VARCHAR, TEXT, etc.

SQL SYNTAX

DEFINITION

SQL syntax refers to the set of rules governing the combination of SQL keywords, clauses, and expressions to form valid SQL statements.

EXAMPLE

- SELECT column1, column2 FROM table_name WHERE condition;

EXERCISE

ANSWER ALL QUESTIONS BELOW

Explain Structured Query Language (SQL).

List FIVE (5) functions of SQL.

Explain fundamental components of SQL with TWO (2) examples.

Identifiers	Data Types	Syntax

List THREE (3) type of data type.

EXERCISE

List data type based on the categories below

Numeric	String	Date and Time

Explain the purposeof DATE data type.

Recognize the suitable data type and size for the attributes given.

- Matric Number
- Date of Birth
- Marks
- Price
- email
- Phone Number
- Address
- Order Id
- Name
- IC Number

QUICK NOTES

TYPES OF SQL LANGUAGE

DDL — DATA DEFINITION LANGUAGE

Used for defining and managing the **structure of the database**

COMMANDS:

- CREATE: Used to create database objects like tables, indexes, views, etc.
- ALTER: Modifies the structure of existing database objects.
- DROP: Deletes database objects.

DML — DATA MANIPULATION LANGUAGE

Used for **manipulating the data** stored in the database

COMMANDS:

- SELECT: Retrieves data from one or more tables.
- INSERT: Adds new records to a table.
- UPDATE: Modifies existing records in a table.
- DELETE: Removes records from a table.

DCL — DATA CONTROL LANGUAGE

Manages **access to data** within the database

COMMANDS:

- GRANT: Provides specific privileges to database users.
- REVOKE: Removes specific privileges from database users.

EXERCISE

ANSWER ALL QUESTIONS BELOW

Explain Data Definition Language (DDL) functions in SQL.

List TWO (2) SQL commands in Data Control Language (DCL).

Explain Data Definition Language (DDL) and Data Manipulation Language (DML). Give TWO (2) example of commands for each type of the SQL language.

State the usage for each of the command below.

DELETE

DROP

ALTER

EXERCISE

WRITE A SQL STATEMENT FOR EACH OF THE SITUATION BELOW

CREATE

	SITUATION	SQL STATEMENT
a.	Write a SQL statement to create a database **DBmovies .**	
b.	Write a SQL statement to create a simple table ***movies*** which should include columns ***movie_id, movie_name, movie_type*** and ***movie_rating***.	
c.	Write a SQL statement to create a simple table ***Songs*** which should include columns ***song_id, song_name, song_type*** and ***song_rating*** only if it does not exist. The song_id should be an unique identifier of the table. It should store an auto incremented value. Each field should not be null too.	
d.	Write a SQL statement to create a simple table ***Gadgets*** which should include columns ***gadjet_id, gadjet_name,*** and ***gadjet_type*** . Each of columns can not be null.	
e.	Write a SQL statement to creates a table called ***Persons*** that contains five columns: ***PersonID, LastName, FirstName, Address, and City***	

EXERCISE

WRITE A SQL STATEMENT FOR EACH OF THE SITUATION BELOW

ALTER

	SITUATION	SQL STATEMENT
a.	Write a SQL statement to rename the ***movies*** table to ***movies_renamed***.	
b.	Write a SQL statement to add a column ***movie_director*** to the ***movies_renamed*** table.	
c.	Write a SQL statement to add a column ***ID*** as a first column of the ***movies_renamed*** table.	
d.	Write a SQL statement to change the data type of the column ***movie_rating*** to integer.	
e.	Write a SQL statement to add primary key for the column ***movie_id*** in the ***movies_renamed*** table.	

DROP

	SITUATION	SQL STATEMENT
a.	Write a SQL statement to drop the ***movies*** table.	
b.	Write a SQL statement to drop the ***job_offer*** and the ***company*** table.	
c.	Write a SQL statement to deletes the ***ContactName*** column from the ***Customers*** table.	
d.	Write a SQL statement to drops a database named testDB.	

EXERCISE

BASED ON THE TABLE GIVEN, WRITE A SQL STATEMENT FOR EACH OF THE SITUATION BELOW

Table: Customer

ID	Name	Age	Address	Salary
1	Khalish	32	Kangar	2000.00
2	Helmi	25	Pendang	1500.00
3	Farzana	23	Batu Pahat	2000.00
4	Morgan	25	Kuantan	6500.00
5	Sew Chin	27	Ipoh	8500.00
6	Yumna	22	Dungun	4500.00
7	Zira	24	Pasir Mas	10000.00

SITUATION		SQL STATEMENT
a.	Create database named SHOP.	
b.	Create table for Make sure column ID, Name, Age cannot be NULL. Set ID as PRIMARY KEY.	
c.	Insert data in Customer table as below.	

EXERCISE

SQL IN

SITUATION		SQL STATEMENT
a.	Use the IN operator to select all the records where ADDRESS is either "Kuantan" or "Pasir Mas".	
b.	Use the IN operator to select all the records where SALARY is 2000, 4500 and 10000.	
c.	Use the IN operator to select NAME and SALARY whose ID is 1, 2 and 3.	
d.	Use the IN operator to select ID, NAME and AGE whose AGE either 27 or 32.	

SQL DISTINCT

SITUATION		SQL STATEMENT
a.	Select all the different values from the SALARY column in the Customer table.	
b.	Select all the different values from the AGE column in the Customer table.	
c.	Select all the different values from the AGE and ADDRESS column in the Customer table.	
d.	Select all the different values from the ADDRESS and SALARY column in the Customer table	

EXERCISE

SQL LIKE

	SITUATION	SQL STATEMENT
a.	Select all records where the value of the NAME column starts with the letter "K".	
b.	Select NAME and AGE where the value of the AGE column ends with the "5".	
c.	Select all records where the value of the ADDRESS column contains the "ng"	
d.	Select NAME and ADDRESS where the value of the ADDRESS column starts with letter "P" and ends with the letter "g".	

EXERCISE

BASED ON THE TABLE GIVEN, WRITE A SQL STATEMENT FOR EACH OF THE SITUATION BELOW

TABLE 1

Table: Novel

Nov_ID	Title	Author	Publisher
N_101	I Was Here	Gayle Forman	Simon & Schuster Ltd
N_102	The Language Inside	Holy Thompson	Random House USA Inc
N_103	The Seventh Sense	Joshua Cooper Ramo	Little, Brown & Company
N_104	Get In Trouble	Kelly Link	Random House

The Novel table has FOUR (4) records which the Primary Key is Nov_ID. Write a SQL statement that will create the table and insert all FOUR (4) records into the table.

EXERCISE

TABLE 2

Table: K-Drama

D_ID	Drama_Title	Year	Genre
KD_101	Goblin	2018	Sci-Fic
KD_102	True Beauty	2020	Romance
KD_103	Crash Landing on You	2019	Melodrama
KD_104	Mad Dog	2017	Thriller

The K_Drama table has FOUR (4) records which the Primary Key is D_ID. Write a SQL statement that will create the table and insert all FOUR (4) records into the table.

EXERCISE

TABLE 3

Table: Employee

Emp_No	Emp_Name	JobTitle	Salary	DeptNo
1001	Smith	Clerk	800	20
1042	Allen Tam	Sales Exec	1600	30
1232	Maznah	Sales Exec	1250	30
1265	Johnny	Manager	2975	20
1098	Fatimah	Sales Exec	1250	30
1245	Leong	Clerk	1100	20
1005	Muthu	Analyst	3000	20

You as a data manager of human resource is required to retrieve information from table Employee. Based on the following queries, use a SQL statement to assist in retrieving required data:

Display the information of employee that has a salary greater than 1000.

Display the information of employee that has a salary between 1000 and 2000.

Display employee's name, job title and salary from department number 30.

Display the employee with job title clerk.

EXERCISE

TABLE 4

Table: Car

Car_ID	Type	Brand	Price	Year
WJE1022	Manual	Toyota Vios	200	2011
W1231A	Automatic	Honda Jazz	210	2018
W5434F	Automatic	Proton Saga	100	2019
VDR9102	Automatic	Honda Accord	280	2020
VFA1021	Automatic	Proton X70	250	2021

The Speedy Car Company has a database of car rental system to make it easier for customer to find cars to rent according to their needs. You are required to retrieve information from the table to help a customer in finding their rental car according to their needs. Use SQL statement for below queries.

Display the of cars that have price between 150 to 250 and the brand is Honda.

Display car_ID, Brand and Year of car which it's brand start with letter "T".

List car_ID, Brand and Price of car and sorted those information in ascending order for the Price.

CHAPTER 4

FUNCTION IN SQL

QUICK NOTES

WHAT IS AN AGGREGATE FUNCTION?

An aggregate function in SQL performs a **calculation on multiple values of a column** and **returns a single value.** An aggregate function **ignores NULL values** when it performs the calculation, **except for the count function.**

5 TYPES OF AGGREGATE FUNCTION

SUM() return the **SUM OF A COLUMN VALUE**

COUNT() return the **NUMBER OF ROWS** in a column

MIN() return the **LOWEST VALUE** in a column

MAX() return the **HIGHEST VALUE** in a column

AVG() return the **AVERAGE VALUE** in a column

EXERCISE

ANSWER ALL QUESTIONS BELOW

Identify FOUR (4) examples of aggregate functions in SQL

Elaborate AVG() and COUNT() function in SQL

EXERCISE

WRITE A SYNTAX FOR THE SQL FUNCTION BELOW TO RETURN A VALUE FROM A COLUMN

SUM()

COUNT()

MIN()

MAX()

AVG()

WRITE A SQL STATEMENT FOR EACH OF THE SITUATION BELOW

a.	Select the record in **Products table** and return the smallest value in the **Price column.**	
b.	Select the record in **Products table** and return the highest value in the **Price column.**	
c.	Return the number of records in **Purchase table** that have 25 as the Book value.	
d.	Calculate the average book orders from the **Order column** in **Purchase table.**	
e.	Calculate the sum of all **Order column** value in **Purchase table.**	

EXERCISE

BASED ON THE TABLE GIVEN, WRITE A SQL STATEMENT FOR EACH OF THE SITUATION BELOW

TABLE 1

Table: Order

ord_no	purch_amt	ord_date	cust_id	salesman_id
101	44.70	2024-01-01	201	301
102	125.75	2024-01-12	201	301
103	98.75	2024-01-16	203	301
104	33.10	2024-01-01	205	305
105	56.80	2024-01-16	203	304

Calculate total purchase amount of all orders. Return total purchase amount.

SQL Statement	
Output	

Calculate average purchase amount of all orders. Return average purchase amount.

SQL Statement	
Output	

EXERCISE

Count the number of unique salesman. Return number of salesman.

SQL Statement	
Output	

Find the maximum purchase amount.

SQL Statement	
Output	

Find the minimum purchase amount.

SQL Statement	
Output	

Find the highest purchase amount ordered by each customer. Return customer ID, maximum purchase amount.

SQL Statement	
Output	

EXERCISE

Find the minimum purchase amount generated by each salesman. Return salesman ID, minimum purchase amount.

SQL Statement	
Output	

Count all the orders generated on '2024-01-01'. Return number of orders.

SQL Statement	
Output	

Find the minimum purchase amount generated by a customer whose ID is 201. Return customer ID and minimum purchase amount.

SQL Statement	
Output	

Find the total purchase amount ordered by customer whose ID in the range 201 and 205 . Return customer ID, total purchase amount.

SQL Statement	
Output	

EXERCISE

BASED ON THE TABLE GIVEN, WRITE A SQL STATEMENT AND ILLUSTRATE THE OUTPUT FOR THE SITUATION GIVEN.

TABLE 1

Table: Menu

menu_id	instock	name	price	category
F1001	10	Siakap Masam Manis	45.00	Ikan
F1021	6	Lemon Madu	25.00	Ayam
F1022	7	Thai Mangga	28.00	Ayam
D1231	6	Oren	7.50	Jus
D1241	8	Tiramisu	9.50	Kek

Display the information on the menu that has the highest price in Chicken category.

SQL statement	
Output	

Calculate the total record of menu.

SQL statement	
Output	

EXERCISE

Calculate the total of stock based on their category. Return stock and category.

SQL statement	
Output	

Display the information on the menu that has the lowest stock.

SQL statement	
Output	

EXERCISE

TABLE 2

Table: Stock

stock_id	instock	collection	price	category
M110	50	Adi Collection	100.00	Baju Melayu
K112	30	Amara Fashion	80.00	Baju Kurung
R132	20	CYD	50.00	Kurta
D123	60	Meena	90.00	Jubah
K113	40	Arafah Design	120.00	Baju Kurung

Display the information on the stock that has the highest price in Baju Kurung category.

SQL statement	
Output	

Calculate the total stock in the store.

SQL statement	
Output	

EXERCISE

Display the information on the stock that has the lowest price.

SQL statement	
Output	

Calculate the total record of stock.

SQL statement	
Output	

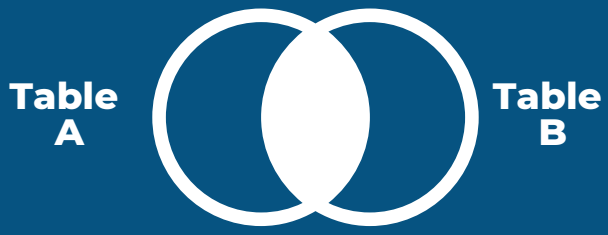
QUICK NOTES

WHAT IS SQL JOINS STATEMENT?

SQL Join statement is used to **combine/ retrieve rows** from **two or more tables (multiple tables)** based on **common field** between them.

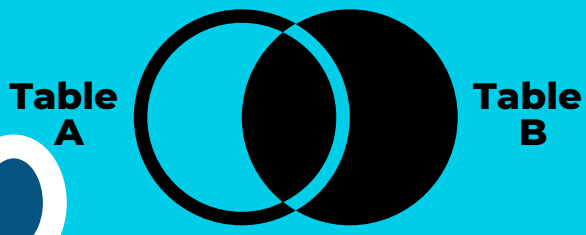
TYPES OF JOINS

Inner Join



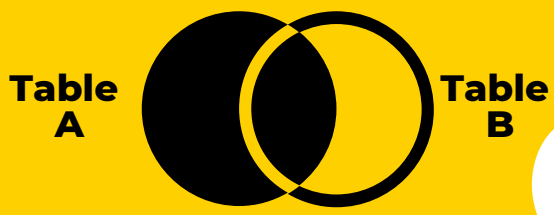
Return MATCHING data from BOTH TABLES

Right Join



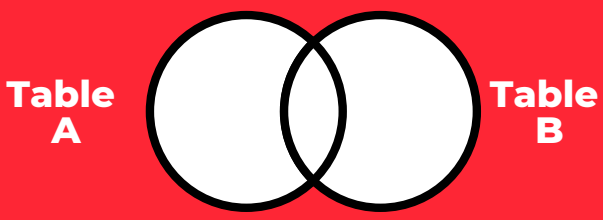
Returns MATCHING data from BOTH tables and all the UNMATCHED data from the RIGHT TABLE

Left Join



Returns MATCHING data from BOTH tables and all the UNMATCHED data from the LEFT TABLE

Full Join



Returns MATCHING data and UNMATCHED data from BOTH TABLES

EXERCISE

WRITE A SYNTAX FOR THE SQL JOINS BELOW

INNER JOIN	
RIGHT JOIN	
LEFT JOIN	
FULL JOIN	

EXERCISE

EXPLAIN THE SQL JOINS BELOW

INNER JOIN	
RIGHT JOIN	
LEFT JOIN	
FULL JOIN	

EXERCISE

BASED ON THE TABLES GICEN, WRITE A SQL JOINS STATEMENT AND ILLUSTRATE THE OUTPUT

TABLE 1

Table: Staff

staff_id	name	age	address	position_id
1	Alina	22	Perak	101
2	Zubir	32	Johor	102
3	Sarah	25	Kedah	103
4	Aryan	30	Perlis	106

Table: Position

position_id	position_name	salary
101	executive	3,000
102	senior executive	5,000
103	programmer	3,500
104	secretary	2,000

EXERCISE

INNER JOIN

SQL statement	
Output	

RIGHT JOIN

SQL statement	
Output	

EXERCISE

LEFT JOIN

SQL statement	
Output	

FULL JOIN

SQL statement	
Output	

EXERCISE

TABLE 2

Table: Member

member_id	name	phone	movie_id
GSC120	Hyun Bin	019-7291201	R1031
GSC121	Park Seo Joon	017-2103418	AC1031
GSC130	Yoona	013-8203134	A4021
GSC521	Kim Go Eun	012-2213531	A4021

Table: Movie

movie_id	name	genre
H1021	Rumah Puaka	Horror
R1031	I Miss You 1000	Romantic
A4021	Frozen 2	Animation
AC1031	Spiderman	Action

EXERCISE

INNER JOIN

SQL statement	
Output	

RIGHT JOIN

SQL statement	
Output	

EXERCISE

LEFT JOIN

SQL statement	
Output	

FULL JOIN

SQL statement	
Output	

EXERCISE

BASED ON THE TABLES AND SQL STATEMENTS GIVEN, WRITE A SQL JOINS STATEMENT AND ILLUSTRATE THE OUTPUT

TABLE 1

Table: Customer

CNO	Cname	Address	CPhone
CR001	Zakaria	Tmn Gembira	012-5566235
CR002	Suzana	Tmn Cempaka	012-5432178
CR003	Chong	Tmn Ampang	019-4567890
CR004	Selvi	Pekan Razaki	016-4139087
CR005	Fatimah	Tmn Rapat	017-6754321

Table: Item

ICode	Iname	Price
IC001	2G Pen Drive	56.50
IC002	CD RW	2.50
IC003	Diskette	10.00
IC004	Keyborad	35.00
IC005	Mouse	23.00

Table: Buy

ID	CNo	Icode	Qty
1	CR001	IC001	1
2	CR002	IC002	5
3	CR001	IC003	1
4	CR004	IC004	2
5	CR001	IC005	1

EXERCISE

SQL statement	**SELECT Customer.CName, Buy.ID** **FROM Customer** **LEFT JOIN Buy** **ON Customer.CNo = Buy.CNo;**
Output	

SQL statement	**SELECT Buy.ID, Customer.CName** **FROM Buy** **INNER JOIN Customer** **ON Buy.CNo = Customer.CNo;**
Output	

EXERCISE

SQL statement	**SELECT Buy.ID, Item.IName** **FROM Buy** **RIGHT JOIN Item** **ON Buy.ICode = Item.ICode;**
Output	

SQL statement	**SELECT Customer.CName, Buy.ID** **FROM Customer** **FULL JOIN Buy** **ON Customer.CNo = Buy.CNo;**
Output	

CHAPTER 5

DATABASE SECURITY

QUICK NOTES

WHAT IS DATABASE SECURITY?

Database security refers to the **protective measures** and **strategies** implemented to **safeguard data stored** within a database from **unauthorized access, breaches, and data corruption.**

WHAT IS DATABASE THREAT?

Threats in Database Management Systems (DBMS) refer to various **risks and vulnerabilities** that can compromise the **security, integrity, and availability of data stored** in a database. These threats can be **intentional**, such as those posed by malicious individuals or hackers, or **unintentional**, stemming from errors or negligence.

MAIN ELEMENT OF DATA SECURITY

Confidentiality

Ensures that only authorized users, with appropriate credentials, have access to data.

Integrity

Ensures that all data is accurate, trustworthy, and not prone to unjustified changes.

Availability

Ensures that data is accessible and available for ongoing business needs in a timely and secure manner.

EXERCISE

ANSWER ALL QUESTIONS BELOW

Define database security

Discuss THREE (3) importances of database security

Define database threat

Discuss THREE (3) threats that can be occured in DBMS

EXERCISE

Explain THREE (3) database security countermeasure can be taken to make sure a DBMS is secure from any threats.

Define Data Control Language (DCL)

List TWO (2) types of Data Control Language (DCL) commands

Explain the usage of GRANT and REVOKE commands.

Write the syntax for GRANT and REVOKE commands.

EXERCISE

ANSWER ALL QUESTIONS BASED ON THE SITUATION GIVEN

Richie Rich Bank profits have decreased due to the threats occured against its database. Among the threats that have been identified are loss of integrity, trojan horse and secrecy breach. Based on your understanding, describe THREE (3) identified threats.

Discuss THREE (3) types of database security countermeasure that can be implemented by the Richie Rich Bank to protect the database system and prevent the threats from happening again in future.

EXERCISE

ANSWER ALL QUESTIONS

Write a SQL statement: Grants the "HR_Manager" role the privileges to select and insert data into the "Employees" table.

Write a SQL statement: Revokes the privilege to delete data from the "Customers" table from the "Sales_Team" role.

ANSWER ALL QUESTIONS BASED ON THE SITUATION GIVEN

Consider tables EMPLOYEE and DEPARTMENT with following schema:

- **Emp (empno, empname, salary, phoneno)**
- **Dept (deptno, deptname, location, jobtype)**

Write SQL statement to grant create table privilege to "Hasan".

Write SQL statement to grant select, insert, update privileges on emp table to "Hasan".

Write SQL statement to revoke select, insert, update privileges on emp table from "Hassan"

EXERCISE

Write SQL statement to grant update privileges on columns of empno and salary of emp table to “Jannah”

Write SQL statement to grant select, insert, delete privileges on emp table to “Jannah”

Write SQL statement to revoke all privileges on emp table from “Jannah”

ANSWER ALL QUESTIONS BASED ON THE SITUATION GIVEN

Employee

Ssn	EName	Eaddress	Esalary	Dno

Department

Dnumber	Dname

Consider the relational database schema as below. The database schema were created by user “X”, who wants to grant privileges to user “A”, “B” and “C”. Write SQL statement for the following statement.

EXERCISE

User “A” is able to create base relations.

User “A” can insert, delete and update in Employee and Department table.

User “B” can insert and update data in both of these relationships.

User “C” can insert and update data in both of these relationships and can grant any of these privileges to other users.

User “A” decides to revoke the insert privilege on the Employee relation from C and revoke the update privilege on Department relation from “B”.

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