Name of the chapter : **Database concepts and the Structured Query Language**

Topic Covered

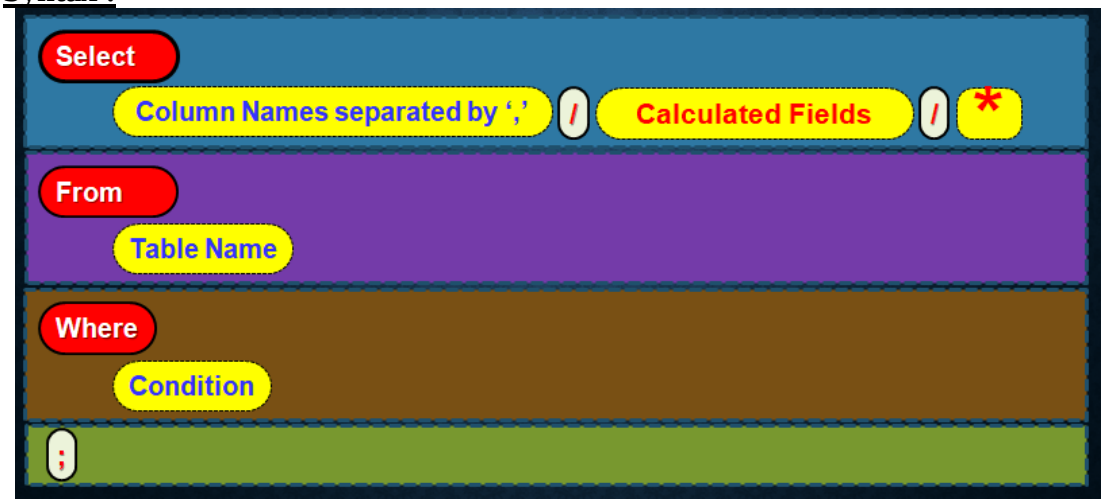
- Database Concepts: Introduction to database concepts and its need,Database Management System.
- Relational data model: Concept of domain, tuple,relation, candidate key, primary key, alternate key
- Advantages of using Structured Query Language, Data Definition Language, Data Query Language and Data Manipulation Language, Introduction to MySQL, Creating a databaseusing MySQL,Data Types
- Data Definition:CREATE DATABASE, CREATE TABLE, DROP, ALTER
- Data Query: SELECT, FROM, WHERE with relational operators, BETWEEN, logical operators, IS NULL, IS NOT NULL
- Data Manipulation: INSERT, DELETE,UPDATE

Key Points

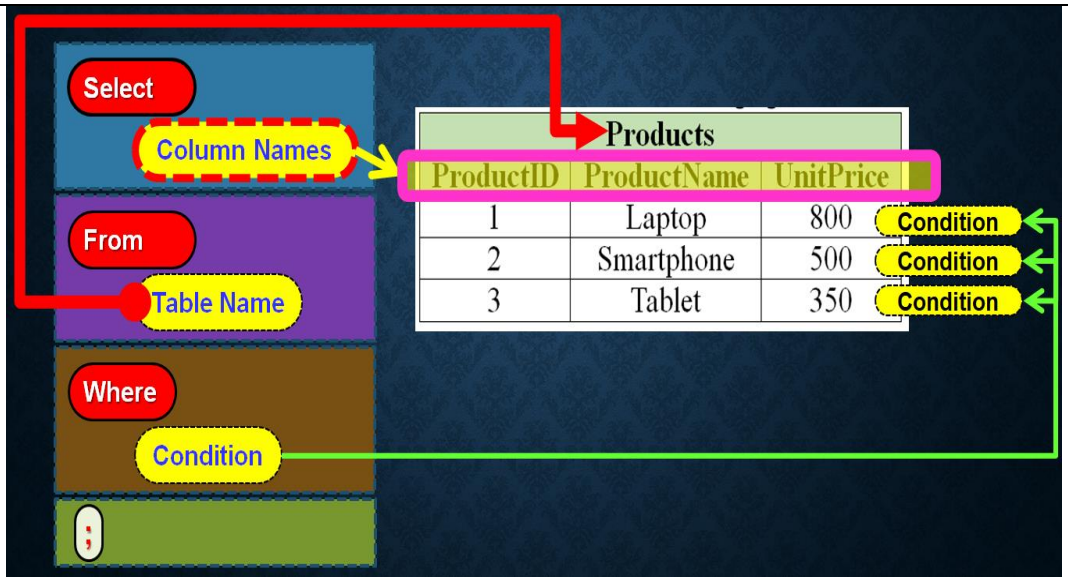
Candidate Key All the attributes combinations inside a relation that can serve as primary key.
Constraint Rule and conditions set for data being stored in a database.
DDL Data Definition Language. SQL part-language that facilitates defining creation/ modification etc. of database objects such as tables, indexes, sequences etc.
DML Data Manipulation Language. SQL part-language that facilitates manipulation (addition/ deletion/ modification) of data residing in database object.
Primary Key A set of one or more attributes that can uniquely identify tuples within the relation.
Relation A table having non-empty atomic values with unordered rows and columns is relation.
SQL Structured Query Language. A non-procedural UGL used for querying upon relational database.
Tuple A row in a relation is called tuple. View A virtual table that does not really exist in its own right but is instead derived from one or more underlying base tables in called a view

(i) **Data Query:** SELECT, FROM, WHERE with operators

Syntax :



Execution :



- Fundamental components of a query used to retrieve specific data from a database table.
- This clauses allow you to specify :
  - **What data** you want to retrieve (**SELECT**),
  - **Which table** it should come from (**FROM**),
  - **Which specific rows** should be included based on a condition (**WHERE**).

Description of each:

(i) **SELECT:**

- used to specify which **columns** or **expressions** you want to retrieve from a database table.
- It is followed by a comma-separated list of column names or expressions enclosed in parentheses.

(ii) **FROM:**

- Specifies the table or tables from which you want to retrieve data.
- It follows the SELECT clause in the SQL query.
- You can query data from one or more tables by listing them after the FROM keyword, separated by commas.

(iii) WHERE:

- Used to filter the rows that are returned from the database table based on a specified condition.
- It follows the FROM clause and is followed by a condition that determines which rows should be included in the result set.
- The condition can include
  - Relational Operators (e.g., '=', '<', '>', '<=', '>=', '<>'),

- Logical Operators (e.g., AND, OR),
- Other functions or expressions.

Example:
```
SELECT
        column1, column2
FROM
        table_name
WHERE
        column1 <= 'value';
```

(a) **Relational Operator** :

Operator Symbol	Description
>	greater than
<	less than
>=	greater than equal to
<=	less than equal to
=	equal
! = or <>	not equal to

(b) **Range Operator Between.** : The BETWEEN operator in SQL is used to filter rows based on a specified range of values.

```
SELECT
        ProductName, Price
FROM
        Products
WHERE
        Price   BETWEEN    10      AND   50;
```

(c) **Logical Operator** : Logical operator is used to combine two or more logical expression,

(i) And – evaluated true if all the logical expression is true otherwise false. E.g.

```
SELECT
        *
FROM
        Customers
WHERE
        Country = 'USA'     AND     City = 'New York';
```

(ii) Or - evaluated true if any the logical expression is true otherwise false. e.g.

```
SELECT
        *
FROM
        Products
WHERE
        Category = 'Electronics'      OR     Price < 50;
```

(d) **Comparing NULL** :

is null, is not null NULL (Absence of value) value cannot be compared using Relational operator.

This statement is used to check whether column contains NULL or not. E.g.

```
SELECT
        *
FROM
        Customers
WHERE
        PhoneNumber IS NULL;
```

30 Objective Question (1 Mark)	
Q1.	A ____ is a property of the entire relation, which ensures through its value that each tuple is unique in a relation
Ans	Attributes
Q2.	A row also called a Record or _____ represents a single, data item in a table. a. Column b. Tuples c. Fields d. None of the above
Ans	Tuples
Q3.	The Primary key is selected from the set of _____
Ans	Candidate keys
Q4.	Which of the following is a group of one or more attributes that uniquely identifies a row? (a) Key (b) Determinant (c) Tuple(d) Relation
Ans	(a) Key
Q5.	Which of the following is a DDL command? (a) SELECT (b) ALTER (c) INSERT (d) UPDATE
Ans	(b) ALTER
Q6.	In SQL, which of the following will select only one copy of each set of duplicate rows from a table. (a) SELECT UNIQUE (b) SELECT DISTINCT (c) SELECT DIFFERENT (d) All of these
Ans	(b) SELECT DISTINCT
Q7.	We can change the structure of a table ie. add, remove or change its column(s) using the _____ statement.
Ans	Alter Table
Q8.	The keyword _____ is used to eliminate redundant data from display. a. Modify b. Distinct c. Describe d. None of the above
Ans	Distinct
Q9.	Give the example of wild card character _____ a. % b. _ c. Both a) and b) d. None of the above
Ans	Both a) and b)
Q10.	The results of the SELECT statement can be displayed in the ascending or descending order of a single column or columns using _____ clause. a. Non Order by b. Modular c. Order by d. Where cause
Ans	Order by
Q11	When the same piece of data is stored in two or more locations, it is called _____. a. Data Redundancy b. Data Integrity c. Data Consistency d. None of the above
Ans	a. Data Redundancy
Q12	The unique field present in the table is called _____. a. Primary Key b. Candidate Key c. Foreign Key d. None of the above
Ans	Primary Key
Q13	SQL stands for _____.

Ans	Structured Query Language
Q14	A _____ is a subset of DML that just deals with information retrieval. a. Query Language b. Structure Language c. Both a) and b) d. None of the above
Ans	Query Language
Q15	A _____ is a language that enables users to access and manipulate data in a database. a. Data Manipulation Language (DML) b. Data Definition Language (DDL) c. Both a) and b) d. None of the above
Ans	Data Manipulation Language (DML)
Q16.	What SQL clause is used to specify the columns you want to retrieve from a table? (A) SELECT (B) FROM (C) WHERE (D) INSERT
Ans	A) SELECT
Q17.	Which SQL clause specifies the table from which data should be retrieved? (A) SELECT (B) FROM (C) WHERE (D) UPDATE
Ans	B) FROM
Q18.	What SQL operator is used for exact value matching in a WHERE clause? (A) LIKE (B) BETWEEN (C) = (D) AND
Ans	C) =
Q19.	Which SQL operator is used to check if a column value falls within a specified range? (A) LIKE (B) BETWEEN (C) = (D) AND
Ans	B) BETWEEN
Q20.	What is the purpose of the IS NULL operator in SQL? (A) It checks if a column contains a specific value. (B) It checks if a column is empty. (C) It checks if a column is not empty. (D) It checks if a column exists.
Ans	B) It checks if a column is empty.
Q21.	Which logical operator combines multiple conditions in a WHERE clause with an OR relationship? (A) AND (B) OR

	(C) NOT (D) XOR
Ans	B) OR
Q22.	What SQL statement is used to add new records to a database table? (A) INSERT (B) DELETE (C) UPDATE (D) ALTER
Ans	A) INSERT
Q23.	Which SQL clause is used to delete records from a database table? (A) INSERT (B) DELETE (C) UPDATE (D) ALTER
Ans	B) DELETE
Q24.	Which SQL clause is used to modify existing records in a database table? (A) INSERT (B) DELETE (C) UPDATE (D) ALTER
Ans	C) UPDATE
Q25.	Which SQL statement is used to remove all records from a table? (A) TRUNCATE (B) DROP (C) DELETE (D) REMOVE
Ans	C) DELETE
Q26	What does the SQL WHERE clause do? (A) It specifies which columns to retrieve. (B) It filters the rows to include based on a condition. (C) It specifies the table to query. (D) It sorts the result set.
Ans	B) It filters the rows to include based on a condition.
Q27	What is the purpose of the NOT operator in a SQL WHERE clause? (A) It negates a condition. (B) It checks if a column is empty. (C) It checks if a column exists. (D) It combines conditions with OR.
Ans	A) It negates a condition.
Q28	Which SQL clause is used to update data in a table with new values? (A) INSERT (B) DELETE (C) UPDATE (D) ALTER
Ans	C) UPDATE
Q29	What SQL operator is used for pattern matching in a WHERE clause? (A) LIKE (B) BETWEEN (C) =

	(D) AND
Ans	A) LIKE
Q30	Which SQL operator checks if a column value is not equal to a specified value in a WHERE clause? (A) LIKE (B) BETWEEN (C) <> (D) AND
Ans	C) <>
10 Assertion and reason Based question (1 Mark)	
In the following questions, a statement of Assertion (A) is followed by statement of Reason . (R). Mark the correct choice as : (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true and R is not the correct explanation of A. (c) A is true but R is false (or partly true) (d) A is false (or partly true) but R is true. (e) Both A and R are false or not fully true.	
Q1.	**Assertion :** A data table can have only one Primary key. **Reason :** In a data table, there can be only one attribute/field containing unique values for each row.
Ans	A is true but R is false (or partly true)
Q2.	**Assertion** : There can be multiple options for choosing a primary key in a data table. **Reason :** All attribute combinations inside a data table that contain unique values for each row, are the candidates keys.
Ans	Both A and R are true and R is not the correct explanation of A
Q3.	**Assertion :** All types of keys contain unique values A data table can have only one Primary key. **Reason :** In a data table, there can be only one attribute/field containing unique values for each row.
Ans	A is true but R is false (or partly true)
Q4.	**Assertion :** A data table can have only one Primary key. **Reason :** In a data table, there can be only one attribute/field containing unique values for each row.
Ans	Both A and R are true and R is not the correct explanation of A.
Q5.	**Assertion :** Foreign key is a non-key attribute whose value is derived from primary key of another table. **Reason :** Each foreign key refers a candidate key in a relation.
Ans	Both (A) and (R) are correct and (R) is not the correct explanation of (A).
Q6.	**Assertion:** The SQL SELECT statement is used to update records in a database. **Reason :** The SELECT statement allows you to retrieve data from a database table.
Ans	(C) The assertion is true, but the reason is false.
Q7.	**Assertion:** The SQL WHERE clause is used for sorting the result set of a query.

	Reason : The WHERE clause specifies conditions to filter rows in a query.
Ans	(C) The assertion is true, but the reason is false.
Q8.	**Assertion:** The IS NULL operator in SQL checks if a column has a value. **Reason :** The IS NULL operator checks if a column contains a specific value.
Ans	(C) The assertion is true, but the reason is false.
Q9.	**Assertion:** The SQL DELETE statement is used to add new records to a database table. **Reason :** The DELETE statement removes records from a database table.
Ans	(B) Both the assertion and reason are true, but the reason does not explain the assertion.
Q10.	**Assertion:** The SQL BETWEEN operator is used for exact value matching in a WHERE clause. **Reason :** The BETWEEN operator checks if a column value falls within a specified range.
Ans	(A) Both the assertion and reason are true, and the reason correctly explains the assertion.

10 Short Knowledge/Understanding/Application Based Questions (2 Marks)

Q1. **Differentiate between DDL and DML with one Example each.**

Ans

DDL	**DML**
Stands for Data definition language	**Stands for** Data manipulation language
Consists of commands used to modify the metadata of a table.	Consist of commands used to modify the data of a table.
Example- create table, alter table, drop table	Example- insert, delete, update

Q2. Correct the error in the following query.
Select * from RECORD where Rname = %math%;

Ans Correct Query: Select * from RECORD where Rname**like** %math%;

Q3. Observe the following tables TRANSACTIONS and CUSTOMERS carefully and answer the questions that follows :

Table : Transaction

TNo	**Type**	**Amount**	**CNo**
T1	CREDIT	1000	C3
T2	DEBIT	1500	C1

CNo	**CNAME**
C1	**ZEESHAN**
C2	**AMAN**

	C3 | **JASPREET** **Table : Customer** (i) What is the degree of the table Transaction ? what is the cardinality of the table Customers ? ii. Identify the primary key and candidate keys from the table Transcations.
Ans	(i) Degree of the table TRANSACTIONS=4 Cardinality of table CUSTOMERS=3 (ii) TNO PRIMARY KEY; TNO, CNO CANDIDATES KEYS
Q4.	Anjali writes the following commands with respect to a table employee having fields, empno, name, department, commission. Command1: Select count(*) from employee; Command2 :Select count(commission) from employee; She gets the output 4 for the first command but get an output 3 for the second command. Explain the output with justification.
Ans	The Count(*) function returns the total number of records in the table while count() will return the count of non-null values in the given field and this is the reason for the different results by the given queries above. The field commission must be containing a NULL value and thus count(commission) returned the count of non-null values and count(*) return total number of records (Irrespective of NULL values in the field).
Q5.	Identify the problem/issue with the following SQL query : SELECT house, count(*) FROM student;
Ans	The problem with the given SQL query is that there is no GROUP BY clause is given and thus, it will lead to an error. The reason being that the select list use COUNT() function, which is an aggregate function, along with a field. When we use an aggregate function in the select list along with a database field, we need to add a GROUP BY clause. To correct the error it should use GROUP BY clasue. SELECT house, count(*) FROM student GROUP BY house;
Q6.	Explain the purpose of the SQL SELECT statement and provide an example of how it is used to retrieve specific data from a database table.
Ans	The SQL SELECT statement is used to retrieve specific data from a database table. Example: SELECT FirstName, LastName FROM Employees;
Q7.	What is the difference between the SQL WHERE and HAVING clauses? Provide an example of when you would use each of them in a query.
Ans	The SQL WHERE clause is used to filter rows before the grouping (e.g., filtering rows before an aggregation), while the HAVING clause is used to filter rows after the grouping (e.g., filtering groups based on aggregate results). Example: Use WHERE to filter employees with a salary above 50,000; Use HAVING to filter departments with an average salary above 60,000.
Q8.	You have a database table named "Employees" with columns "EmployeeID," "FirstName," and "LastName." Write an SQL query to retrieve the first and last names of all employees whose first name is "John."
Ans	SELECT FirstName, LastName FROM Employees WHERE FirstName = 'John';
Q9.	Describe the primary function of the SQL INSERT statement and provide an example of how it is used to add new records to a database table.
Ans	The primary function of the SQL INSERT statement is to add new records to a database table. Example: INSERT INTO Employees (FirstName, LastName) VALUES ('Jane', 'Doe');
Q10.	You have a table named "Products" with columns "ProductID," "ProductName," and "Price."

	Write an SQL query to update the price of a product with a ProductID of 101 to $25.50.
Ans	UPDATE Products SET Price = 25.50 WHERE ProductID = 101;
10 Short Knowledge/Understanding/Application Based Questions (3 Marks)	
Q1.	Differentiate between Primary Key and Alternate Key.
Ans	<table><tr><th>Primary keys</th><th>Alternate keys</th></tr><tr><td>Primary keys - Contain one or more columns whose combined values uniquely identify every row in a table. Each table can have only one primary key.</td><td>Alternate keys - Contain one or more columns whose combined values uniquely identify every row in a table.</td></tr></table>
Q2.	In a multiplex, movies are screened in different auditoriums. One movie can be shown in more than one auditorium. In order to maintain the record of movies, the multiplex maintains a relational database consisting of two relations viz. MOVIE and AUDI respectively as shown below: Movie(Movie_ID, MovieName, ReleaseDate) Audi(AudiNo, Movie_ID, Seats, ScreenType,TicketPrice) a) Is it correct to assign Movie_ID as the primary key in the MOVIE relation? If no, then suggest an appropriate primary key. b) Is it correct to assign AudiNo as the primary key in the AUDI relation? If no, then suggest appropriate primary key. c) Is there any foreign key in any of these relations?
Ans	a) Yes, because every movie will have it's unique id. b) Yes, because every auditorium will be assigned a unique id. No two auditoriums will have same id. c) Yes, Movie_ID in Audi table is the foreign because it references the Movie_ID in the Movie table.
Q3.	An organisation wants to create a database EMPDEPENDENT to maintain following details about its employees and their dependent. EMPLOYEE(AadharNumber, Name, Address,Department,EmployeeID) DEPENDENT(EmployeeID, DependentName, Relationship) a) Name the attributes of EMPLOYEE, which can be used as candidate keys. b) The company wants to retrieve details of dependent of a particular employee. Name the tables and the key which are required to retrieve this detail c) What is the degree of EMPLOYEE and DEPENDENT relation?
Ans	a) AadharNumber and EmployeeID can be used for candidate keys because they are unique to every employee. b) Employee and Dependent tables are required. EmployeeID is the key to retrieve the required data. c) Degree of Employee relation = 5 and degree of Dependent relation = 3 The number of attributes in a relation is called the Degree of the relation.
Q4.	Why foreign keys are allowed to have NULL values? Explain with an example.
Ans	In a relational database, a foreign key is a field that refers to the primary key in another table. The foreign key establishes a link or relationship between two tables. In some database systems, foreign keys are allowed to have NULL values, Allowing foreign keys to have NULL values can be useful in certain scenarios, such as when one have optional relationships between tables. In such cases, the absence of a foreign key value indicates that there is no corresponding entry in the referenced table.
Q5.	Compared to a file system, how does a database management system avoid redundancy in

	data through a database?
Ans	A database management system (DBMS) is designed to provide a structured and efficient way to store, retrieve, and manage data. Compared to a file system, a DBMS offers several features and mechanisms to avoid redundancy in data and promote data integrity. Here are some key ways in which a DBMS achieves this: Data Normalization: Reduction of Redundant Data: Foreign Keys: DBMSs use foreign keys to establish relationships between tables. Data Type Enforcement: DBMSs enforce consistent data types for columns, preventing the storage of incompatible data. Constraints: Integrity constraints, such as unique constraints and check constraints, ensure that data adheres to specified rules, preventing the insertion of duplicate or inconsistent information. ACID Properties: Atomicity, Consistency, Isolation, Durability (ACID): DBMSs adhere to these fundamental properties
Q6.	Explain the purpose of SQL transactions and why they are important in database management.
Ans	SQL transactions are used to ensure the atomicity, consistency, isolation, and durability (ACID) properties of a database. Transactions are important to maintain data integrity by allowing a series of SQL statements to be executed as a single, indivisible unit, ensuring that either all changes are applied or none.
Q7.	Describe the differences between the SQL INNER JOIN, LEFT JOIN, and RIGHT JOIN operations. Provide an example for each
Ans	**INNER JOIN**: Returns records that have matching values in both tables. Example: **SELECT * FROM Table1 INNER JOIN Table2 ON Table1.ID = Table2.ID;** **LEFT JOIN:** Returns all records from the left table (Table1), and the matched records from the right table (Table2). Unmatched records from Table2 will contain NULL values. Example: **SELECT * FROM Table1 LEFT JOIN Table2 ON Table1.ID = Table2.ID;** **RIGHT JOIN:** Returns all records from the right table (Table2), and the matched records from the left table (Table1). Unmatched records from Table1 will contain NULL values. Example: **SELECT * FROM Table1 RIGHT JOIN Table2 ON Table1.ID = Table2.ID;**
Q8.	You have a database table named "Orders" with columns "OrderID," "CustomerID," and "OrderDate." Write an SQL query to retrieve the number of orders placed by each customer.
Ans	SELECT CustomerID, COUNT(OrderID) AS OrderCount FROM Orders GROUP BY CustomerID;
Q9.	Describe the purpose of SQL indexes and their significance in database performance optimization.
Ans	SQL indexes are data structures that improve the speed of data retrieval by allowing the database management system to locate specific rows more quickly, similar to the index in a book. They enhance database performance by reducing the need for the database engine to scan the entire table when searching for specific data.
Q10.	You have a database table named "Students" with columns "StudentID," "FirstName," "LastName," and "Age." Write an SQL query to delete all students below the age of 18.

Ans | DELETE FROM Students WHERE Age < 18;

10 Short Knowledge/Understanding/Application Based Questions (4 Marks)

Q1. Consider the following table ACTIVITY and COACH and answer the following parts of this question :Table : ACTIVITY

Acode	ActivityName	Stadium	ParticipantsNum	PrizeMoney	ScheduleDate
1001	*Relay 100 x 4*	*Star Annex*	*16*	*10000*	*23-Jan-04*
1002	*High Jump*	*Star Annex*	*10*	*12000*	*12-Dec-03*
1003	*Shot Put*	*Super Power*	*12*	*8000*	*14-Feb-04*
1005	*Long Jump*	*Star Annex*	*12*	*9000*	*01-Jan-04*
1008	*Discuss Throw*	*Super Power*	*10*	*15000*	*19-Mar-04*

TABLE COACH

PCode	Name	ACode
1	*Ahmad Hussain*	*1001*
2	*Ravinder*	*1008*
3	*Janila*	*1001*

Give the output of the following SQL queries:

(i) SELECT COUNT(DISTINCT ParticipantsNum) FROM ACTIVITY;

(ii) SELECT MAX(ScheduleDate), MIN(ScheduleDate) FROM ACTIVITY;

(iii) SELECT Name,ActivityName FROM ACTIVITY A, COACH C WHERE A.Acde=C.Acode AND A.ParticipantsNum=10;

(iv) SELECT DISTINCT ParticipantsNum FROM ACTIVITY;

Ans

(i) COUNT(DISTINCT ParticipantsNum) ---------- 3

(ii) MAX(ScheduleDate) MIN(ScheduleDate) ---------- 19-Mar-04 12-Dec-03

(iii) Name ActivityName ---------- Ravubder Discuss Throw

(iv) DISTINCT ParticipantsNum ---------- 16 10 12

Q2. **Choose appropriate answer with respect to the following code snippet.**

CREATE TABLE student (name CHAR(30), student_id INT, gender CHAR(1), PRIMARY KEY (student_id));

a) What will be the degree of student table?

b) What does ‘name’ represent in the above code snippet?

c) What is true about the following SQL statement?

Select * FROM student;

i) Displays contents of table ‘student’

ii) Displays column names and contents of table ‘student’

iii) Results in error as improper case has been used

iv) Displays only the column names of table ‘student’

d) In the following query how many rows will be deleted?

DELETE student

WHERE student_id=109;

Ans

a) 3, b) a column c) Displays column names and contents of table ‘student’

e) All the rows where student ID is equal to 109

Q3.

TID	TName	TSal	TDept	TDesig	

1	Amit	2000	IT	PGT
2	Sunit	1500	HISTORY	TGT
3	Naina	1800	MATH	PGT

Write the sql command for the following queries and answer the question

a. What is degree and Cardinality of the Table : Teacher
b. Identify the primary key in the table
c. Display the records of all PGT staff
d. Increase the salary of teachers of Math Department.

Ans

a. Degree 5, Cardinality 3
b. b.TID
c. Select * from Teacher Where TDesig =PGT;
d. Update Teacher set salary= salary + salay *20/100 Where TDept=Math

Q4. **Suppose your school management has decided to conduct cricket matches between students of class XI and Class XII. Students of each class are asked to join any one of the four teams — Team Titan, Team Rockers, Team Magnet and Team Hurricane. During summer vacations, various matches will be conducted between these teams. Help your sports teacher to do the following:**

a) Create a database "Sports".
b) Create a table "TEAM" with following considerations:
   i) It should have a column TeamID for storing an integer value between 1 to 9, which refers to unique identification of a team.
   ii) Each TeamID should have its associated name (TeamName), which should be a string of length not less than 10 characters

c. Using table level constraint, make TeamID as primary key
d. Show the structure of the table TEAM using SQL command.

Ans

a.Create database Sports;
use Sports
b. create table team (teamidint(1), teamname varchar(10));
c. alter table team add primary key (teamid);
d. desc team;

Q5. Consider the following table STOCK and DEALERS and answer the following parts of this question :

Table :STOCK

Item No	**Item**	**Dcode**	**Qty**	**UnitPrice**	**StockDate**
5005	Ball Pen 0.5	102	100	16	31-Mar-10
5003	Bal Pen 0.25	102	150	20	01-Jan-10
5002	Gel Pen Premium	101	125	14	14-Feb-10
5006	Gel Pen Classis	101	200	22	01-Jan-09
5001	Eraser Small	102	210	5	19-Mar-09
5004	Eraser Big	102	60	10	12-Dec-09
5009	Sharpener Classis	103	160	8	23-Jan-09

Table :DEALERS

Dcode	Dname
101	Reliable Stationers

	103 Classis Plastics 102 Clear Deals Give the output of the following SQL queries: (i) SELECT COUNT(DISTINCT Dcode) FROM STOCK; (ii) SELECT QTY*UnitPrice FROM STOCK WHERE ItemNo=5006; (iii) SELECT Item, Dname FROM STOCK S DEALERS D WHERE S.Dcode=D.Dcode AND ItemNo=5004; (iv) (iv) SELECT MIN(StockDate) FROM STOCK;
Ans	(i) COUNT(DISTINCT Dcode) ---------- 3 (ii) QTY*UnitPrice ---------- 4400 (iii) Item Dname (iv) MIN(StockDate) --- ---------- Eraser Big Clear Deals 01-Jan-09
Q6.	Describe the differences between a primary key and a foreign key in a database table. Provide an example of how they are used in a real-world scenario.
Ans	A primary key is a unique identifier for a record in a table, ensuring that each row has a distinct value. A foreign key is a field in one table that refers to the primary key in another table, establishing a relationship between the two. For example, in a database for an e-commerce site, the "CustomerID" in the "Orders" table is a foreign key that links to the "CustomerID" in the "Customers" table.
Q7.	You have two database tables: "Customers" and "Orders." Write an SQL query to retrieve the names of customers who have placed more than five orders.
Ans	SELECT Customers.CustomerName FROM Customers JOIN Orders ON Customers.CustomerID = Orders.CustomerID GROUP BY Customers.CustomerName HAVING COUNT(Orders.OrderID) > 5;
Q8.	You are tasked with designing a database TABLES for a library. Describe the necessary tables, including primary keys and foreign keys, to store information about books, authors, borrowers, and book loans.
Ans	(i) Table "Books": BookID (PK), Title, ISBN, AuthorID (FK). (ii) Table "Authors": AuthorID (PK), FirstName, LastName. (iii) Table "Borrowers": BorrowerID (PK), FirstName, LastName, ContactInfo. (iv) Table "BookLoans": LoanID (PK), BookID (FK), BorrowerID (FK), LoanDate, ReturnDate
Q9.	Consider the following tables customer and orders:

Customers

CustomerID	CustomerName	ContactName	Country
1	Customer A	John Doe	USA
2	Customer B	Jane Smith	Canada
3	Customer C	David Johnson	UK
4	Customer D	Emily Brown	Australia

5	Customer E	Michael Lee	Germany

Orders			
OrderID	**CustomerID**	**OrderDate**	**TotalAmount**
101	1	2023-01-15	500.00
102	2	2023-02-20	750.00
103	1	2023-03-10	300.00
104	3	2023-04-05	900.00
105	4	2023-05-15	600.00

(A) Write an SQL query to retrieve the names of customers (CustomerName) who have placed orders.
(B) Write an SQL query to calculate the total amount of orders placed by each customer. Display the customer's name (CustomerName) and the total order amount.
(C) Write an SQL query to find the customer (CustomerName) who placed the highest total order amount and the corresponding total amount.
(D) Write an SQL query to retrieve the CustomerName and OrderDate for orders placed in the year 2023.

Ans

(A)
```
SELECT DISTINCT c.CustomerName
FROM Customers c
INNER JOIN Orders o ON c.CustomerID = o.CustomerID;
```

(B)
```
SELECT c.CustomerName, SUM(o.TotalAmount) AS TotalOrderAmount
FROM Customers c
INNER JOIN Orders o ON c.CustomerID = o.CustomerID
GROUP BY c.CustomerName;
```

(C)
```
SELECT TOP 1  c.CustomerName, SUM(o.TotalAmount) AS TotalOrderAmount
FROM Customers c
INNER JOIN Orders o ON c.CustomerID = o.CustomerID
GROUP BY c.CustomerName
ORDER BY TotalOrderAmount DESC;
```

(D)
```
SELECT c.CustomerName, o.OrderDate
FROM Customers c
INNER JOIN Orders o ON c.CustomerID = o.CustomerID
WHERE YEAR(o.OrderDate) = 2023;
```

Q10. Consider the following tables:

Employees		
EmployeeID	**FirstName**	**LastName**
1	John	Doe
2	Jane	Smith
3	Michael	Johnson
4	Sarah	Davis
5	Kevin	Lee

Salaries	
EmployeeID	**Salary**
1	60000
2	55000
3	62000
4	58000
5	63000

(a) Write an SQL query to retrieve the first names, last names, and salaries of employees.
(b) Write an SQL query to calculate the average salary of employees.
(c)Write an SQL query to find the first names of employees whose salary is higher than the

	average salary. (d) Write an SQL query to increase the salary of employees by 10% if their salary is less than 60000.
Ans	(a) SELECT E.FirstName, E.LastName, S.Salary FROM Employees E JOIN Salaries S ON E.EmployeeID = S.EmployeeID; (b) SELECT AVG(Salary) AS AverageSalary FROM Salaries; (c) SELECT FirstName FROM Employees WHERE Salary > (SELECT AVG(Salary) FROM Salaries); (d) UPDATE Salaries SET Salary = Salary * 1.10 WHERE Salary < 60000;
07 Case Based Questions (5 Marks)	
Q1.	A library uses database management system(DBMS) to store the details of the books that it stocks, its registered members and the book-loan that the library has made. These details are stored in a database using the following three relations. Name of the Database : KV Library • **Book** (BookID : Char(5), Title : Varchar(25), Author :Varchar(25), Publisher : Varchar(100)) •**Member**(MemberID:Char(5), LastName:Varchar(25), FirstName:Varchar(25), Correspondence-Address : Varchar(100), Pincode : Char(6), DateofBirth : Date, EmailID : Varchar(50)) •**Loan**(MemberID: Char(5), BookID:Char(5), LastDate:Date, DueBackDate:Date, Returned :Boolean) **Note : The Library does not stock more than one copy of the same book** (a) Identify following types of keys from all the relations of the given database Foreign keys along with parent relations. 2 (b) Can a relation have multiple foreign keys? Give example. 1 (c) Can a foreign key be part of a primary key? Give example 1 (d) Write a SQL query to retrieve the names and email addresses of the 1members belonging to KVS (they have email ids as _____@kvs.in) and have not returned their books
Ans	(a) (iii) Loan Table (b) I. (i) Book : Title (ii) Member: EmailID II. No, the Loan relation cannot have alternate key as its primary key is a composite key having foreign key. (c) INSERT INTO Loan Values('M1255', 'B3100', '02/02/2020', '09/02/2020', False) (d) Select FirstName, LastName, EmailID

	From Member, Loan Where Member.MemberID=Loan.MemberID AND Returned = 'False';
Q2.	Rachana Mittal runs a beauty parlor. She uses a database management system(DBMS) to store the information that she needs to manage her business. This information includes customer contact details, staff names, the treatments that the parlor offer (for example, ''Hair Massage') and appointment that customers have made for treatments. A separate appointment must be made for each treatment. The details are stored in a database using the following four relations: **Customer**: (CustomerID, FirstName, LastName, TelephoneNumber, EmailAddress) **Staff**: (StaffID, FirstName,LastName, IsQualified) Treatment: (TreatmentName,Price,TimeTaken,NeedsQualification) Appointment : (CustomerID,TreatmentName,ApDate,ApTime) • The **IsQualified** attribute for a member of staff stores one of the value True or False, to indicate if the member of staff is fully qualified or not. •The **NeedsQualifiction** attribute for a treatment stores True or False to indicate if the treatment can only be given by a qualified member of staff. •The **TimeTaken** attribute for a treatment is the number of minutes (a whole number) that the treatment takes. (a) Write a SQL statement to create the table staff. (b) Write a query to Insert a record in the table Staff with following data ; (2009, 'Sheril', 'Mark', 'True') (c) Which table's records can be deleted without affecting any other table? (i) Customer (ii) Staff (iii) Treatment (iv) Appointment (d) Write a query to Modify table Appointment to add a new column StaffID, which should hold a legal StaffID value from the staff table. (e) Rachana wants to send e-mail advertisement to all the customers who had a 'RF Facial' treatment in 2020. To send the email, the customer's email address, firstname and lastname are needed. Write a SQL query to retrieve the email address, firstname and lastname of each customer to whom email should be sent.
Ans	(a) Create Table Staff (StaffID Number(4,0) NOT NULL PRIMARY KEY, FirstName Varchar(20) NOT NULL, LastNameVarchar(20), ISQualifiedChar(4) Check (IsQualified IN('True', 'False'))); (b) INSERT INTO Staff Values(2009, 'Sheril', 'Mark', 'True'); (c) (ii) Staff table's records can be deleted without affecting any other table as of now, because this table is not linked with any other table yet. (d) Alter Table Appointment Add StaffIDNumber(4,0) NOT NULL Reference Staff(StaffID); (e) Select EmailAddress, FirstName,LastName From Customer C, Appointment A Where C.CustomerID=A.CustomerID AND TreatmentName= 'RF Facial';
Q3.	**Online Store:** You are managing an online store database with two tables: "Products" and "Orders." **Products** **ProductID** | **ProductName** | **UnitPrice** 1 | Laptop | 800 2 | Smartphone | 500 3 | Tablet | 350 **Orders** **OrderID** | **ProductID** | **Quantity** 101 | 1 | 2 102 | 2 | 3 103 | 1 | 1

Question: Write SQL queries to perform the following tasks:
(a) Retrieve the total sales revenue for each product (sales = quantity * unit price).
(b) Find the product total sales revenue in highest to lowest order.
(c) Retrieve the product names that have not been ordered.
(d) Increase the unit price of all products by 10%. e. Delete the order with OrderID 102.

Ans

(a)
```
SELECT P.ProductName, SUM(O.Quantity * P.UnitPrice) AS TotalRevenue
FROM Products P
LEFT JOIN Orders O ON P.ProductID = O.ProductID
GROUP BY P.ProductName;
```

(b)
```
SELECT      P.ProductName
FROM        Products P
LEFT JOIN Orders O ON P.ProductID = O.ProductID
GROUP BY   P.ProductName
ORDER BY   SUM(O.Quantity * P.UnitPrice) DESC;
```

(c)
```
SELECT P.ProductName
FROM Products P
LEFT JOIN Orders O ON P.ProductID = O.ProductID
WHERE O.OrderID IS NULL;
```

(d)
```
UPDATE Products
SET UnitPrice = UnitPrice * 1.10;
```

(e)
```
DELETE FROM Orders WHERE OrderID = 102;
```

Q4. Employee Performance

You are managing an employee performance database with a "Performance" table.

Performance		
EmployeeID	**Month**	**Rating**
1	Jan	4
2	Jan	5
1	Feb	5
2	Feb	4

Question: Write SQL queries to perform the following tasks:
(a) Calculate the average rating for each employee for the months of January and February.
(b) Find the employee rating in ascending order.
(c) Identify employees who received a rating of 4 or higher in both January and February.
(d) Increase the rating of all employees by 1 for the month of March.
(e) Delete all records for employees with an average rating below 4.

Ans

(a)
```
SELECT      EmployeeID, AVG(Rating) AS AverageRating
FROM        Performance
WHERE       Month IN ('Jan', 'Feb')
GROUP BY  EmployeeID;
```

(b)
```
SELECT      EmployeeID
FROM        Performance
ORDER BY   RATING
```

(c)
```
SELECT      EmployeeID
```

```
        FROM        Performance
        WHERE       Month IN ('Jan', 'Feb')
        GROUP BY  EmployeeID
        HAVING      MIN(Rating) >= 4;
```

(d)
```
        UPDATE      Performance
        SET         Rating = Rating + 1
        WHERE       Month = 'Mar';
```

(e)
```
        DELETE FROM  Performance
        WHERE        EmployeeID IN (  SELECT      EmployeeID
                                      FROM        Performance
                                      WHERE       Month IN ('Jan', 'Feb')
                                      GROUP BY    EmployeeID
                                      HAVING      AVG(Rating) < 4
                                   );
```

Q5. **Student Enrollment**

You are managing a student enrollment database with two tables: "Students" and "Courses."

Students		
StudentID	**FirstName**	**LastName**
1	Alice	Smith
2	Bob	Johnson
3	Carol	Davis

Courses	
CourseID	**CourseName**
101	Math
102	History
103	Science

Question: Write SQL queries to perform the following tasks:
(a) Retrieve the total number of students enrolled in each course.
(b) Insert a new the student with following details (Id= 1, Name = Don Bradman)
(c) Retrieve the courses that have not been enrolled in.
(d) Update the last name of student with StudentID 1 to "Brown."
(e) Delete the enrollment record for StudentID 3 in CourseID 103.

Ans (a)
```
        SELECT C.CourseName, COUNT(E.StudentID) AS Enrollments
        FROM Courses C
        LEFT JOIN StudentsEnrollments E ON C.CourseID = E.CourseID
        GROUP BY C.CourseName;
```

(b)
```
        INSERT INTO students
        VALUES (1, “Don”,  “Bradman”)
```

(c)
```
        SELECT  C.CourseName
        FROM     Courses C  LEFT JOIN StudentsEnrollments E ON C.CourseID =
E.CourseID
        WHERE   E.StudentID IS NULL;
```

(d)
```
        UPDATE      Students
        SET         LastName = 'Brown'
        WHERE       StudentID = 1;
```

(e) DELETE FROM StudentsEnrollments
WHERE StudentID = 3 AND CourseID = 103;

Q6. **Employee Records**

You are managing an employee records database with a single table: "Employees."

Employees				
EmployeeID	**FirstName**	**LastName**	**Department**	**Salary**
1	John	Doe	Sales	50000
2	Jane	Smith	Marketing	55000
3	Michael	Johnson	IT	60000
4	Sarah	Davis	Sales	52000
5	Kevin	Lee	IT	62000

Question: Write SQL queries to perform the following tasks:
(a) Retrieve the average salary for each department.
(b) Find the department with the highest salary.
(c) Insert a new row in table with suitable data.
(d) Update the salary of John Doe (EmployeeID 1) to 52000.
(e) Delete the employee with the lowest salary.

Ans

(a)
```
SELECT Department, AVG(Salary) AS AvgSalary
FROM Employees
GROUP BY Department;
```

(b)
```
SELECT Department, MAX (Salary)
FROM Employees
```

(c)
```
INSERT INTO Employees
VALUES (6, “Brain”, “Lara”, “IT”, 92000);
```

(d)
```
UPDATE Employees
SET Salary = 52000
WHERE EmployeeID = 1;
```

(e)
```
DELETE FROM Employees
WHERE Salary = ( SELECT MIN (Salary) FROM Employees );
```

Q7. **Online Bookstore :** You are managing an online bookstore database with two tables: "Books" and "Authors."

Books			
BookID	**Title**	**AuthorID**	**Price**
1	To Kill a Mockingbird	1	15.99
2	1984	2	12.49
3	The Great Gatsby	3	10.99

Authors	
AuthorID	**AuthorName**
1	Harper Lee
2	George Orwell
3	F. Scott Fitzgerald

Question: Write SQL queries to perform the following tasks:
(a) Retrieve the titles and prices of all books.
(b) Retrieve the names of authors who have books priced at or above 15.00.
(c) Update the price of "1984" (BookID 2) to 13.99.
(d) Delete the book with BookID 3 from the database.
(e) Add a new book titled "Pride and Prejudice" by "Jane Austen" with a price of 14.50.

Ans	(a)	SELECT Title, Price FROM Books;
	(b)	SELECT A.AuthorName FROM Authors A INNER JOIN Books B ON A.AuthorID = B.AuthorID WHERE B.Price >= 15.00;
	(c)	UPDATE Books SET Price = 13.99 WHERE BookID = 2;
	(d)	DELETE FROM Books WHERE BookID = 3;
	(e)	INSERT INTO Books (Title, AuthorID, Price) VALUES ('Pride and Prejudice', 4, 14.50);

Name of the chapter : **Introduction to Emerging Trends**

Topics Covered

- Artificial Intelligence, Machine Learning, Natural Language Processing, Immersive experience(AR,VR),Robotics,Big data and its characteristics
- Internet of Things(IoT),Sensors,Smartcities,Cloud Computing and Cloud Services(SaaS, IaaS,PaaS);Grid Computing,Block chain technology.

Key Points

Artificial Intelligence (AI)

Artificial intelligence refers to devices or programmes that resemble human intelligence in order to carry out tasks and have the ability to iteratively improve themselves based on the data they gather

Machine Learning

Machine learning is a branch of artificial intelligence that enables computers to learn from data using statistical methods without explicit human programming. It includes algorithms that use information to learn on their own and anticipate the future.

Natural Language Processing (NLP)

Natural Language Processing (NLP) It deals with how people and computers communicate using human spoken languages like Hindi, English, etc. In fact, using our voice to conduct a web search, use a device, or control another device is achievable.

Virtual Reality – Virtual Reality (VR) is a three-dimensional, computer-generated situation that simulates the real world. The user can interact with and explore that environment by getting search immersed in it while interacting with the objects and other actions of the user.

Augmented Reality – The term "augmented reality" refers to the superimposition of computer-generated perceptual information over the actual physical surroundings (AR). Consider Pokémon Go as an illustration, where players look for animated characters that appear in their real-world surroundings on their phone or tablet.

Internet of Things (IoT)

The "Internet of Things" is a collection of interconnected devices that can connect to one another and exchange data in the same network or you can say, It is a overall network of interconnected devices as well as the technology that enables communication between them.

Sensors

Sensors are frequently used as monitoring and observing components. The development of IoT is being greatly aided by the evolution of smart electronic sensors. It will result in the development of fresh, intelligent systems with sensors.

smart city use the information and communication technologies (ICT), for creating, implementing, and promoting sustainable development methods to handle the issues of