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CORPER ANALYTICS WORKSHOP 3.0

REPORT ON HOSPITAL MANAGEMENT SYSTEM (DATABASE AND IMPLEMENTATION)

ORDER OF EXECUTION IN SQL

1. **FROM:** The query starts by determining which table(s) to retrieve data from, including any joins, if specified.
2. **WHERE:** Filters the rows based on the specified conditions. Only rows that meet the criteria are considered for further processing.
3. **GROUPBY:** Groups the selected rows based on one or more columns.
4. **HAVING:** Filters the groups created by the GROUP BY clause, using conditions similar to the WHERE clause, but applied after the groups are formed.
5. **SELECT:** The clause selects the columns to be included in the final result.
6. **DISTINCT:** Removes duplicate rows from the result set (if applicable), after selecting the columns.
7. **ORDERBY:** Sorts the result set based on the specified columns in ascending or descending order.
8. **LIMIT/OFFSET:** Limits the number of rows returned and/or skips a specified number of rows.

READ ON NORMALIZATION (in not less than 300 words), TYPES OF NORMAL FORMS WITH REAL WOLRD EXAMPLES.

Normalization is a process in database design that organizes data to minimize redundancy and dependency. The main objective of normalization is to decompose large tables into smaller, well-structured tables while ensuring the integrity of the data. This process helps reduce data anomalies, ensures efficient data retrieval, and makes the database more flexible to handle changes. Normalization primarily involves dividing a database into tables and defining relationships between the tables.

TYPES OF NORMAL FORMS:

Normalization is done in stages known as "normal forms." Each form represents a higher level of database organization. The most common normal forms are:

1. **First Normal Form (1NF):** In 1NF, a table is organized such that:
 - Each column contains atomic (indivisible) values.
 - Each entry in a column contains only one value (no repeating groups or arrays).

A table that violates 1NF may have columns that store multiple values. To achieve 1NF, the table needs to be restructured so that each value is stored separately.

2. **Second Normal Form (2NF):** A table is in 2NF if:
 - It is in 1NF.
 - All non-key attributes are fully dependent on the primary key (i.e., there is no partial dependency).

Partial dependency occurs when a non-key attribute depends on part of a composite key, rather than the whole key.

3. **Third Normal Form (3NF):** A table is in 3NF if:

- It is in 2NF.
- It does not have any transitive dependency (i.e., non-key attributes should not depend on other non-key attributes).

Real World Example

- University Student Database
- Employee-Department Database

CONCLUSION:

Normalization is essential for creating efficient and scalable databases. By reducing redundancy and ensuring data integrity, normalization ensures that data is easier to manage and maintain. Though the process might require creating more tables and setting relationships between them, it significantly improves performance and consistency, making the database more adaptable to change.

DEFINING THE RELATIONSHIPS BETWEEN THE TABLE

Patients table: Primary key - PatientID.

Doctors Table: Primary key – DoctorID.

Department Table: Primary Key – DepartmentID.

Appointment Table: Primary Key – AppointmentID, Foreign Key – PatientID and DoctorID.

Treatment Table: Primary Key – TreatmentID, Foreign Key – PatientID and DoctorID.

MedicalRecord Table: Primary Key – MedicalReportID, Foreign Key – PatientID and DoctorID.

ENTITY RELATIONAL DIAGRAM (ERD) CONCEPTUAL EXPLANATION

One to Many relationships exist between the patient and appointment, Doctors and Appointments, Doctors and Department, Patients and Treatment, Appointment and DepartmentLocation, Medical Record and Appointment, Medication and Treatment and, Appointment and MedicalReport .

DATATYPE

- **INTEGER (INT):** Whole numbers without decimals (e.g., 4, -2).
- **VARCHAR:** Stores variable-length strings of text (e.g., "Hello", "Data123").
- **TEXT:** Used for longer strings of text.
- **DECIMAL:** Stores fixed-point numbers, often used for precise calculations, especially with money or quantities (e.g., DECIMAL (10,2) can store up 10 digits, with 2 of them being after the decimal point).
- **CHARACTER (CHAR):** A single character (e.g., 'A', '5').
- **FLOAT:** Numbers with decimal points (e.g., 12.2).
- **DATE/TIME:** Stores date and time information (e.g., 2024-09-09).

DATA INTEGRITY

- **NOT NULL:** It is a constraint in SQL that ensures that a column cannot have a NOT NULL value. This means that when inserting data into the table, a value must always be provided for the column that has the NOT NULL Constraint.

- **FOREIGN KEY:** it is a field in one table that refers to the primary key in another table, establishing a relationship between the two.
- **Primary key:** uniquely identifies each record in a table.

RELATIONAL CONCEPTS

DATABASE

```
CREATE DATABASE HospitalManagementSystem;
```

TABLES CREATION

DEPARTMENT TABLE

```
--Creating Department Table
```

```
CREATE TABLE DEPARTMENT (
    DepartmentID VARCHAR(10) PRIMARY KEY,
    DepartmentName VARCHAR(50) NOT NULL,
);
SELECT * FROM DEPARTMENT;
```

PATIENT TABLE

```
CREATE TABLE Patient (
    PatientsID VARCHAR(10) PRIMARY KEY,
    FirstName VARCHAR(30),
    LastName VARCHAR(30),
    DateOfBirth DATE,
    Gender char(1),
    PhoneNumber VARCHAR(20),
    Address VARCHAR(255),
    BloodType VARCHAR(10),
);
```

DOCTOR'S TABLE

```
-- CREATE DOCTORS TABLE
CREATE TABLE Doctors (
    DoctorsID VARCHAR(10) PRIMARY KEY,
    FirstName VARCHAR(30) NOT NULL,
    LastName VARCHAR(30) NOT NULL,
    Specialization VARCHAR(225),
    PhoneNumber VARCHAR(20),
    DepartmentID VARCHAR(10),
    CONSTRAINT FK_Doctor_DepartmentID FOREIGN KEY (DepartmentID) REFERENCES Department(DepartmentID) --FOREIGN KEY
);
SELECT * FROM Doctors;
```

DEPARTMENT LOCATION TABLE

```
-- CREATING DEPARTMENTS LOCATION
CREATE TABLE DepartmentLocation (
    DepartmentLocationID VARCHAR(10) PRIMARY KEY,
    DepartmentLocation VARCHAR(30)
);
```

MEDICATION TABLE

```
--CREATING MEDICATION TABLE
CREATE TABLE Medication (
    MedicationID VARCHAR(10) PRIMARY KEY,
    MedicationName VARCHAR(100) NOT NULL
);
```

APPOINTMENT TABLE

```
CREATE TABLE Appointment (
    AppointmentID VARCHAR(10) PRIMARY KEY,
    PatientsID VARCHAR(10) NOT NULL,
    DoctorsID VARCHAR(10),
    AppointmentDate DATE NOT NULL,
    ReasonForVisit VARCHAR(150),
    Status VARCHAR(100),
    DepartmentLocationID VARCHAR(10),
    CONSTRAINT FK_Appointment_PatientID FOREIGN KEY (PatientsID) REFERENCES Patient(PatientsID), --FOREIGN KEY FOR PATIENTS
    CONSTRAINT FK_Appointment_DoctorsID FOREIGN KEY (DoctorsID) REFERENCES Doctors(DoctorsID), --FOREIGN KEY FOR DOCTORS
    CONSTRAINT FK_Appointment_DepartmentLocationID FOREIGN KEY (DepartmentLocationID) REFERENCES DepartmentLocation(DepartmentLocationID) --FOREIGN KEY FOR DEPART
);
```

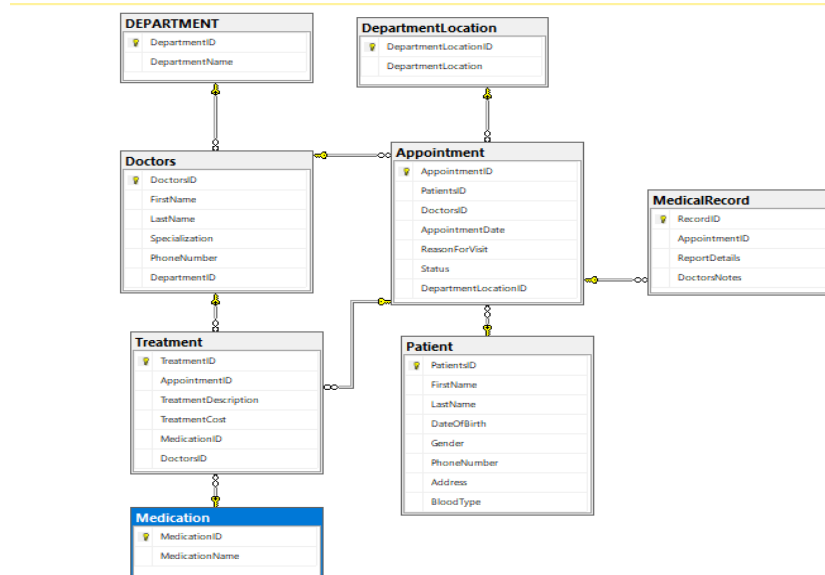
TREATMENT TABLE

```
CREATE TABLE Treatment(  
    TreatmentID VARCHAR(10) PRIMARY KEY,  
    AppointmentID VARCHAR(10) NOT NULL,  
    TreatmentDescription TEXT,  
    TreatmentCost DECIMAL(10, 2),  
    MedicationID VARCHAR(10),  
    DoctorsID VARCHAR(10),  
    CONSTRAINT FK_Treatment_AppointmentID FOREIGN KEY (AppointmentID) REFERENCES Appointment(AppointmentID), --FOREIGN KEY FOR APPOINTMENTS  
    CONSTRAINT FK_Treatment_MedicationID FOREIGN KEY (MedicationID) REFERENCES Medication(MedicationID), --FOREIGN KEY FOR MEDICATIONS  
    CONSTRAINT FK_Treatment_DoctorsID FOREIGN KEY (DoctorsID) REFERENCES Doctors(DoctorsID) --FOREIGN KEY FOR DOCTORS  
);
```

MEDICAL RECORD TABLE

```
CREATE TABLE MedicalRecord(  
    RecordID VARCHAR(10) PRIMARY KEY,  
    AppointmentID VARCHAR(10) NOT NULL,  
    ReportDetails TEXT,  
    DoctorsNotes VARCHAR(255),  
    CONSTRAINT FK_MedicalRecords_AppointmentID FOREIGN KEY (AppointmentID) REFERENCES Appointment(AppointmentID) --FOREIGN KEY FOR APPOINTMENTS  
);
```

ENTITY RELATIONAL DIAGRAM (ERD) CONCEPT



DATA POPULATION

| | MedicationID | MedicationName |
|----|--------------|----------------|
| 1 | M001 | Atenolol |
| 2 | M002 | Propranolol |
| 3 | M003 | Brimonidine |
| 4 | M004 | Latanoprost |
| 5 | M005 | Palivizumab |
| 6 | M006 | Caffeine |
| 7 | M007 | Hydrocortosone |
| 8 | M008 | Tacrolimus |
| 9 | M009 | Mometasone |
| 10 | M010 | Fluticasone |
| 11 | M011 | Ciprofloxacin |
| 12 | M012 | Amoxicillin |
| 13 | M013 | Azithromycin |
| 14 | M014 | Prednisolone |
| 15 | M015 | Metoprolol |
| 16 | M016 | Losartan |
| 17 | M017 | Timolol |
| 18 | M018 | Cyclopentolate |
| 19 | M019 | Surfactant |
| 20 | M020 | Phenobarbital |

| | DepartmentID | DepartmentName |
|---|--------------|----------------|
| 1 | DP001 | Cardiology |
| 2 | DP002 | Ophthalmology |
| 3 | DP003 | Neonatology |
| 4 | DP004 | Dermatology |
| 5 | DP005 | Otolaryngology |

| | DepartmentLocationID | DepartmentLocation |
|---|----------------------|--------------------|
| 1 | DP001 | BLOCK A |
| 2 | DP002 | BLOCK B |
| 3 | DP003 | BLOCK C |
| 4 | DP004 | BLOCK D |
| 5 | DP005 | BLOCK E |

| | TreatmentID | AppointmentID | TreatmentDescription | TreatmentCost | MedicationID | DoctorsID |
|----|-------------|---------------|---|---------------|--------------|-----------|
| 1 | TR001 | A001 | Blood pressure management | 200000.00 | M001 | DR001 |
| 2 | TR002 | A002 | Beta-blocker therapy | 300000.00 | M002 | DR002 |
| 3 | TR003 | A003 | Glaucoma management | 800000.00 | M003 | DR003 |
| 4 | TR004 | A004 | Latanoprost for eye pressure | 950000.00 | M004 | DR004 |
| 5 | TR005 | A005 | Respiratory syncytial virus (RSV) treatment | 50000.00 | M005 | DR005 |
| 6 | TR006 | A006 | Caffeine citrate for apnea in premature infants | 950000.00 | M006 | DR002 |
| 7 | TR007 | A007 | Skin inflammation management | 950000.00 | M007 | DR003 |
| 8 | TR008 | A008 | Tropical treatment for dermatitis | 300000.00 | M008 | DR001 |
| 9 | TR009 | A009 | Eczema treatment | 830000.00 | M009 | DR002 |
| 10 | TR010 | A010 | Psoriasis treatment | 500000.00 | M010 | DR003 |
| 11 | TR011 | A011 | Antibiotic therapy for sinus infection | 280000.00 | M011 | DR004 |
| 12 | TR012 | A012 | Amoxicillin for ear infection | 650000.00 | M012 | DR005 |
| 13 | TR013 | A013 | Azithromycin for throat infection | 320000.00 | M013 | DR002 |
| 14 | TR014 | A014 | Prednisolone for laryngitis | 805000.00 | M014 | DR004 |
| 15 | TR015 | A015 | Hypertension management with metoprolol | 950000.00 | M015 | DR005 |
| 16 | TR016 | A016 | Hypertension management with Losartan | 150000.00 | M016 | DR002 |
| 17 | TR017 | A017 | Glaucoma treatment with Timolol | 420000.00 | M017 | DR003 |
| 18 | TR018 | A018 | Pupil dilation for eye exam | 200000.00 | M018 | DR001 |
| 19 | TR019 | A019 | Surfactant therapy for neonatal respiratory dist... | 660000.00 | M019 | DR002 |
| 20 | TR020 | A020 | Seizure management with phenobarbital | 800000.00 | M020 | DR003 |

| | RecordID | AppointmentID | ReportDetails | DoctorsNotes |
|----|----------|---------------|---|--|
| 1 | MR001 | A001 | Blood pressure within normal range, patient respondi... | Continue with current medication. |
| 2 | MR002 | A002 | Patient showed improvement with beta-blocker ther... | Monitor side effect and adjust dosage if necessary. |
| 3 | MR003 | A003 | Intraocular pressure reduced after starting glaucoma... | Recommnd continued us of Bromonidine. |
| 4 | MR004 | A004 | Patient eye pressure improving with Latanoprost. | Advise follow-up after two weeks. |
| 5 | MR005 | A005 | RSV treatment administered, patient stabilized. | Monitor respiratory status for further complication. |
| 6 | MR006 | A006 | Caffeine Citate effectively reducing apnea episodea... | Continue current dosage. |
| 7 | MR007 | A007 | Skin inflammation reduced with Hydrocortisone treat... | Continue foe another week and reasses. |
| 8 | MR008 | A008 | Dermatitis symptons improving with Tacrolimu. | Monitor for any adverse reactions. |
| 9 | MR009 | A009 | Eczema lesions responding to Mometasone treatment. | Recommend continued use. |
| 10 | MR010 | A010 | Psoriasis flares reduced with Fluticasone. | Advice use of emollients alongside steroid. |
| 11 | MR011 | A011 | Sinus infection improved after ciprofloxacin. | Finish antibiotics course and schedule a follow ... |
| 12 | MR012 | A012 | Ear infection improving with Amoxicillin | Recommend completing the antibiotics course |
| 13 | MR013 | A013 | Throat infection subsiding with Azithromycin. | No further intervention needed at this point. |
| 14 | MR014 | A014 | Laryngitis inflammation reduced with prednisolone. | Advise voice rest and hydration. |
| 15 | MR015 | A015 | Blood pressure controlled with Metropolol. | Continue current treatment |
| 16 | MR016 | A016 | Hypertension under control with Losartan. | Advise patient to continue regular monitoring. |
| 17 | MR017 | A017 | Glucoma symptoms managed well with Timolol. | No adverse reactions, continue as prescribed. |
| 18 | MR018 | A018 | Pupil dilation effective for eye examination. | No complication observed, follow-up schedule. |
| 19 | MR019 | A019 | Respiratory distress symptoms improving with surfact... | Patient remain under observation. |
| 20 | MR020 | A020 | Seizures reduced with Phenobarbital. | Monitor for any side effects of drug interactions. |

| | DoctorsID | FirstName | LastName | Specialization | PhoneNumber | DepartmentID |
|----|-----------|-------------|----------|----------------|-------------|--------------|
| 1 | DR001 | Tiwatope | Adeoye | Cardiology | 09076752172 | DP001 |
| 2 | DR002 | Williams | Faith | Ophthalmology | 08176752172 | DP002 |
| 3 | DR003 | Enioluwa | Joel | Neonatology | 08176776512 | DP003 |
| 4 | DR004 | Murewa | Bamabas | Dermatology | 07076776512 | DP004 |
| 5 | DR005 | Christopher | Martinez | Otolaryngology | 09076776765 | DP005 |
| 6 | DR006 | Elizabeth | Lucas | Ophthalmology | 09078762172 | DP002 |
| 7 | DR007 | Karen | Jones | Neonatology | 08176734215 | DP003 |
| 8 | DR008 | Cliton | Nickel | Cardiology | 09067552172 | DP001 |
| 9 | DR009 | Patricia | Brown | Ophthalmology | 08176765432 | DP002 |
| 10 | DR010 | Lauren | David | Neonatology | 08197656512 | DP003 |
| 11 | DR011 | Dabirasire | Bamidele | Dermatology | 07076776900 | DP004 |
| 12 | DR012 | Rebecca | Martinez | Otolaryngology | 08170096765 | DP005 |
| 13 | DR013 | Judith | Jude | Ophthalmology | 09078753172 | DP002 |
| 14 | DR014 | Grace | Wealth | Dermatology | 09067765121 | DP004 |
| 15 | DR015 | Mary | Andrew | Otolaryngology | 08126776765 | DP005 |
| 16 | DR016 | Fikayomi | Martinz | Ophthalmology | 08154362172 | DP002 |
| 17 | DR017 | Thomas | Peter | Neonatology | 08187000215 | DP003 |
| 18 | DR018 | Iremide | Laurance | Cardiology | 09068753172 | DP001 |
| 19 | DR019 | Angel | Smith | Ophthalmology | 07070985432 | DP002 |
| 20 | DR020 | Gift | Samson | Neonatology | 08164316512 | DP003 |

| | PatientsID | FirstName | LastName | DateOfBirth | Gender | PhoneNumber | Address | BloodType |
|----|------------|-----------|-----------|-------------|--------|-------------|--|-----------|
| 1 | P001 | Faith | Jayden | 1986-11-11 | F | 08187387018 | Wuse, Abuja, Nigeria | O- |
| 2 | P002 | Jane | Peter | 1987-11-24 | F | 09087387018 | 567 Maple St, Springfield, USA | O- |
| 3 | P003 | John | Timber | 1999-01-02 | M | 09087399008 | 577 Maple St, Springfield, USA | A- |
| 4 | P004 | Alfred | Cliton | 1987-06-14 | M | 09087387088 | 124 Palm Ave, Miami, Florida, USA | AB- |
| 5 | P005 | Winnry | Fred | 1987-02-24 | F | 08187387000 | 432, Ocean Blvd, Santa Monica, California, USA | A+ |
| 6 | P006 | Victor | Clever | 1977-09-01 | M | 07099738701 | 765 Desert Rd, Phoenix, Arizona, USA | AB- |
| 7 | P007 | Kate | Andrew | 1996-03-25 | F | 07066538481 | 890, Lakeshore Dr, Chicago, USA | O+ |
| 8 | P008 | Harlan | Smith | 1993-04-21 | M | 08166538481 | 891, Lakeshore Dr, Chicago, USA | AB+ |
| 9 | P009 | Angeina | Davis | 1976-05-10 | F | 07098387010 | 1600 Pennsylvania Ave NW, Washington, USA | B- |
| 10 | P010 | Harden | Miller | 1989-11-26 | M | 09027387023 | 456 Ranch Rd, Asutin, Texas, USA | B- |
| 11 | P011 | Emmanuel | Rodriguez | 1993-01-05 | M | 08123399009 | 123 Main St, New York | AB- |
| 12 | P012 | Boothe | Anderson | 2003-07-14 | M | 08023387087 | 234 Fremont St, Las Vegas, Nevada, USA | AB- |
| 13 | P013 | Challie | Jackson | 1997-02-23 | M | 07045387000 | 321, River RD, Newark, New Jersey, USA | A+ |
| 14 | P014 | Peter | Taylor | 1992-09-01 | M | 09087978701 | 765 Desert Rd, Phoenix, Arizona, USA | AB+ |
| 15 | P015 | Maryjane | Wilson | 1996-08-25 | F | 08165438481 | 880, Lakeshore Dr, Chicago, USA | O+ |
| 16 | P016 | Wealth | Lopez | 1993-04-12 | F | 07098653848 | 789 Magnolia Ln, Brimingham, Alabama, USA | AB+ |
| 17 | P017 | Matthew | Brown | 1998-01-22 | M | 08144687008 | 345 Aspen Way, Denver, Colorado, USA | A- |
| 18 | P018 | Peace | Cliton | 1994-10-14 | F | 07086387088 | 194 Palm Ave, Miami, Florida, USA | AB- |
| 19 | P019 | Nimi | James | 2000-12-24 | F | 09064438700 | 422, Ocean Blvd, Santa Monica, California | A+ |
| 20 | P020 | Sheldon | Thomas | 2001-09-07 | M | 07098642601 | 795 Desert Rd, Phoenix, Arizona, USA | O+ |

| | AppointmentID | PatientsID | DoctorsID | AppointmentDate | ReasonForVisit | Status | DepartmentLocationID |
|----|---------------|------------|-----------|-----------------|------------------------|-----------|----------------------|
| 1 | A001 | P001 | DR001 | 2024-09-21 | Follow up Check | Scheduled | DP001 |
| 2 | A002 | P002 | DR002 | 2024-09-02 | Follow-up Check | Completed | DP002 |
| 3 | A003 | P003 | DR003 | 2024-08-17 | Cataract Surgery | Scheduled | DP001 |
| 4 | A004 | P004 | DR004 | 2024-09-17 | Routine Check up | Scheduled | DP004 |
| 5 | A005 | P005 | DR005 | 2024-11-08 | Routine Check up | Completed | DP005 |
| 6 | A006 | P007 | DR007 | 2024-09-03 | Heart Palpitations | Cancelled | DP001 |
| 7 | A007 | P006 | DR006 | 2024-09-02 | Eye pain | Scheduled | DP002 |
| 8 | A008 | P008 | DR008 | 2024-09-11 | Follow up Check | Cancelled | DP001 |
| 9 | A009 | P009 | DR009 | 2024-09-01 | Post Surgery Follow up | Scheduled | DP002 |
| 10 | A010 | P010 | DR010 | 2024-10-04 | Post surgery follow up | Scheduled | DP001 |
| 11 | A011 | P011 | DR011 | 2024-11-25 | Diabetic Management | Completed | DP002 |
| 12 | A012 | P012 | DR012 | 2024-10-07 | Follow up check | Completed | DP002 |
| 13 | A013 | P013 | DR013 | 2024-11-06 | Follow up check | Scheduled | DP003 |
| 14 | A014 | P014 | DR014 | 2024-09-12 | Myocardial Surgery | Cancelled | DP003 |
| 15 | A015 | P015 | DR015 | 2024-10-08 | Post-Surgery Follow up | Scheduled | DP001 |
| 16 | A016 | P016 | DR016 | 2024-11-27 | Skin Irritation | Scheduled | DP004 |
| 17 | A017 | P017 | DR017 | 2024-08-05 | Hearing Test | Completed | DP005 |
| 18 | A018 | P018 | DR018 | 2024-10-09 | Follow up Chek | Completed | DP003 |
| 19 | A019 | P019 | DR019 | 2024-09-19 | Routine Check up | Completed | DP003 |
| 20 | A020 | P020 | DR020 | 2024-09-13 | Acne Symptoms | Completed | DP004 |

CHALLENGES ENCOUNTERED

- DATABASE NORMALIZATION:** Understanding and applying database normalization principles (1NF, 2NF, 3NF) and properly structuring data to reduce redundancy.
Resolution: I sought clarification on how to handle specific data operations (like ensuring data integrity through constraints like NOT NULL).
- SQL QUERY STRUCTURE AND ORDER OF EXECUTION:** I faced some confusion about the order of execution in SQL queries.
Resolution: I sought an explanation of the order in which SQL operations are executed (e.g., FROM, WHERE, SELECT, etc.)