BRAINWAVE MATRIX SOLUTIONS

Internship Task – Abhilash Antony

Introduction…

During my internship at Brainwave Matrix Solutions, I was presented with a unique opportunity to contribute to the design and implementation of a comprehensive Hospital Management System database. This task was particularly significant, given the critical role that effective data management plays in the healthcare sector. The primary objective of my project was to enhance the functionality and performance of the database. To achieve this, I started by employing a range of SQL techniques, including subqueries, joins, stored procedures, triggers, and transaction control language (TCL).
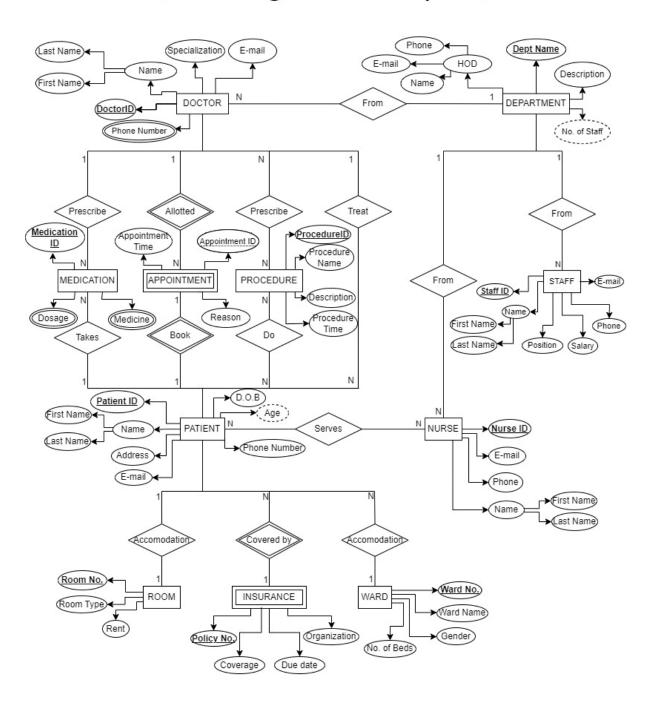
The decision to focus on a Hospital Management System stemmed from the dynamic and complex nature of healthcare environments, where vast volumes of patient, staff, and treatment data must be managed efficiently and accurately. Within this context, my aim was to ensure seamless handling of transactions and queries to facilitate quick access to crucial information, which is vital for decision-making and operational efficiency.

In this report, I will present a detailed overview of the processes undertaken throughout my internship, including the design of the database schema, the implementation of various SQL queries, and the results obtained from the tasks performed. Additionally, I will discuss the specific tables involved, such as those related to staff, patients, doctors, appointments, rooms, and others, illustrating how each component contributes to the overall effectiveness of the Hospital Management System. This comprehensive approach not only aims to highlight the technical aspects of database management but also to demonstrate the real-world applications of these techniques in enhancing healthcare delivery. The SQL codes and other attachments of the task can be accessed at my [Git-hub Repository](#).

Database Design…

Before diving into the SQL queries and database management tasks, it's essential to understand the overall structure of the hospital database system. The **Entity-Relationship (ER) Diagram** below illustrates the relationships between key entities such as **Doctor**, **Patient**, **Staff**, **Room**, **Appointment**, and others. This diagram serves as the foundation for all database operations, ensuring that each entity is properly connected and that data can be efficiently managed and retrieved. The ER diagram visually represents how various elements of the hospital interact with one another, establishing the relational structure necessary for executing complex queries and procedures.

ER Diagram - Hospital

In the database schema for the hospital management system, several tables were created to effectively organize and manage various entities within the healthcare environment. Each table serves a specific purpose and ensures that data integrity and relationships among different entities are maintained. Below is a brief overview of the tables created along with sample records:

1. **Department Table**: This table stores information about the various departments within the hospital, including the department name, description, and details about the head of the department (HOD).

Department_Name	Description	HOD_First_Name	HOD_Last_Name	HOD_Phone_Number	HOD_Email
Dermatology	Branch of medicine dealing with the skin	Ushas	Devasia	8985847856	ushasdevasia@stjohns.com
ENT	Treats a range of problems related to the ear, ...	Rahul	Kesav	8986815245	rahulkesav@stjohns.com
Internal Medicine	Study, diagnosis and treatment of conditions th...	Ashok	Augustine	9854752615	ashokaugustine@stjohns.com
Neurology	Study and treatment of disorders of the nervou...	Thomas	Xavier	8086254535	thomasxavier@stjohns.com
OB/GYN	Care women from pregnancy until after delivery...	Alen	Blake	6854986541	alenblake@stjohns.com
Ophthalmology	Field of medicine that focuses on the health of t...	Arsha	Babu	9365874512	arshapbabu@stjohns.com
Orthopedics	Focuses on treating the musculoskeletal system	Jyothis	Devasia	9748956325	jyothisdevasia@stjohns.com
Padiatrics	Care of infants, children and adolescents from ...	Edwin	Joshy	9594658515	edwinjoshy@stjohns.com
Psychiatry	Diagnosis, treatment and prevention of mental,...	Nandhana	Krishna	8680854745	nandhanakrishna@stjohns.com
Surgical Department	Administers the provision of surgical, diagnostic ...	Domina	Sebastian	9747982705	dominasebastian@gmail.com
NULL	NULL	NULL	NULL	NULL	NULL

2. **Doctor Table**: This table maintains records of the doctors associated with the hospital, including their specialization, contact information, and the department to which they belong.

DoctorID	First_Name	Last_Name	Specialization	Email	Department_Name
17845	Aleena	Anna	Obstetrics	aleenaanna@stjohns.com	OB/GYN
18756	Walter	White	Dermatologist	walterwhite@stjohns.com	Dermatology
18759	Akshay	Krishna	General Surgen	akshaykrishna@stjohns.com	Surgical Department
18769	Lim	Nolan	Psychiatrist	limnolan@stjohns.com	Psychiatry
18965	Adam	Arnold	Orthopedist	adamarnold@stjohns.com	Orthopedics
19187	Alfy	Shaju	Neurologist	alfykshaju@stjohns.com	Neurology
19237	Anusha	Shaju	Gynecologist	anushakshaju@stjohns.com	OB/GYN
19456	Shaun	Murphy	General Medicine	shaunmurphy@stjohns.com	Internal Medicine
19875	Jack	Ryan	Otolaryngologist	jackryan@stjohns.com	ENT
20142	John	Justin	Ophthalmologist	johnjustin@stjohns.com	Ophthalmology
NULL	NULL	NULL	NULL	NULL	NULL

3. **Doctor Phone Table**: This table holds additional phone numbers for doctors, linking back to the main Doctor table to ensure easy access to their contact information.

DoctorID	Phone_No
19456	9895963625
18759	9785456525
19237	8086574595
18756	9695784515
17845	8685487885
20142	8485896585
18965	9895969475
19875	9593924575
18769	9096351625
19187	9589952125

4. **Staff Table**: This table contains details about hospital staff, such as their positions, salaries, and departmental assignments. It also includes an auto-incremented StaffID for unique identification.

StaffID	First_Name	Last_Name	Position	Salary	Phone_Number	Email	Department_Name
4001	Anjana	John	Physician Assistant	30000	9895963625	anjanajohn@stjohns.com	Internal Medicine
4002	Bibin	Samuel	Dietitian	45000	9784585965	bibinsamuel@stjohns.com	Internal Medicine
4003	Aaron	Bloke	Social Worker	30000	9794658515	aaronbloke@stjohns.com	Internal Medicine
4004	Saji	Jaison	Midwife	20000	9545678912	sajijaison@stjohns.com	OB/GYN
4005	Malavika	Biju	Ultrasonographer	35000	9897596865	malavikabiju@stjohns.com	OB/GYN
4006	Pamy	Sebastian	Dermatologic surgeon	30000	6832659845	pamysebastian@stjohns.com	Dermatology
4007	Celin	Charlie	Optometrist	45000	6865623545	celincharlie@stjohns.com	Ophthalmology
4008	Vismaya	Biju	Physiatrist	40000	6265784512	vismayabiju@stjohns.com	Orthopedics
4009	Jais	Binoy	Physical Therapist	55000	9865784512	jaisbinoy@stjohns.com	Orthopedics
4010	Daniya	Deepak	Prosthetist	42000	8684759625	daniyadeepak@stjohns.com	Orthopedics
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

5. **Nurse Table**: Similar to the Doctor table, this table records information about the nursing staff, including their contact details and the department they are assigned to.

NurseID	First_Name	Last_Name	Phone_Number	Email	Department_Name
20185	Rafeeq	Riyas	8574859645	rafeeqriyas@stjohns.com	Internal Medicine
20456	Rajesh	Rahul	7538642565	rajeshrahul@stjohns.com	Internal Medicine
21015	Delbin	Dawn	8956457823	delbindawn@stjohns.com	Internal Medicine
21123	Saniya	Jose	9392524156	saniyakjose@stjohns.com	OB/GYN
21191	Fathima	Riyas	9236021542	fathimariyas@stjohns.com	Padiatrics
21259	Namitha	Catherine	7418526548	namithacatherine@stjohn.com	Surgical Department
21563	Ushas	Thomas	9465823545	ushasthomas@stjohns.com	Padiatrics
21963	Sandra	Johns	9685742310	sandrajohns@stjohns.com	OB/GYN
22016	Rijo	Rajeev	8527419635	rijorajeev@stjohns.com	Surgical Department
22865	Reena	Robin	7539512688	reenarobin@stjohns.com	OB/GYN
NULL	NULL	NULL	NULL	NULL	NULL

6. **Room Table**: This table captures details about patient rooms, including room type, rental costs, and occupancy status, helping manage bed availability within the hospital.

Room_No	Room_Type	Rent_Per_Day	Occupancy_Status	Television
201	Normal	1000	Occupied	0
202	Normal	1000	Occupied	0
203	Deluxe	2500	Occupied	1
204	Deluxe	2500	Vacant	1
205	Deluxe	2500	Occupied	1
206	Premium Deluxe	4500	Vacant	1
207	Premium Deluxe	4500	Occupied	1
208	Premium Deluxe	4500	Vacant	1
209	Normal	1000	Vacant	0
210	Deluxe	2500	Occupied	1
NULL	NULL	NULL	NULL	NULL

7. **Ward Table**: This table organizes information about the different wards in the hospital, specifying the number of beds available and the head nurse assigned to each ward.

Ward_No	Ward_Name	Gender	Total_Beds	Beds_Available	Head_Nurse_ID
1001	General Ward	Male	150	50	22865
1002	General Ward	Female	180	60	22865
1003	Surgical Ward	Other	50	30	20456
1004	Orthopedic Ward	Male	50	35	20456
1005	Neurology Ward	Female	60	35	22016
1006	Oncology Ward	Male	50	15	20185
1007	Pediatrics Ward	Female	150	50	21259
1008	Maternity Ward	Female	100	20	21963
1009	Postpartum Ward	Female	120	30	21563
1010	Psychiatric Ward	Male	80	60	21191
NULL	NULL	NULL	NULL	NULL	NULL

8. **Insurance Table**: This table catalogs the various insurance policies available to patients, detailing coverage amounts and premiums, thus facilitating billing and patient care management.

Policy_No	Organisation	Effective_Date	Coverage_Amount	Premium
ALZ192	Allianz	2024-10-30	900000	12500
BSH732	Berkshire Hathaway	2024-08-25	600000	7200
CBL432	Chubb Limited	2024-07-30	500000	3900
LIC425	Life Insurance Co	2023-12-28	400000	3250
MTL785	MetLife	2024-05-30	500000	5500
NIA025	New India Assurance	2024-02-28	600000	4500
PDL456	Prudential	2024-06-30	400000	3000
SBI734	SBI Life	2024-10-12	350000	2750
UNH146	United Health	2023-12-30	200000	2500
ZRI702	Zurich Insurance	2024-02-02	300000	1750
NULL	NULL	NULL	NULL	NULL

9. **Medication Table**: This table tracks the medications prescribed by doctors, along with their dosage instructions and categories, ensuring accurate medication management for patients.

MedicationID	DoctorID	Medicine_Name	Dosage	Category
ABT72586	19237	Diphenhydramine	1-1-1	Allergy reliever, sleep aid
FJN72583	17845	Metformin	1-1-1	Diabetes medication
GEN75896	19456	Acetaminophen	1-0-1	Pain reliever, fever reducer
GNM72458	19456	Naproxen	1-0-1	Pain reliever, fever reducer, anti-inflammatory
KFT72851	19237	Aspirin	0-0-1	Pain reliever, fever reducer, blood thinner
POS85325	19187	Azithromycin	1-1-1	Antibiotic
RFS25830	17845	Atorvastatin	0-0-1	Cholesterol-lowering medication
SLM74156	19237	Fluoxetine	1-0-0	Antidepressant
VTG46259	20142	Hydrochlorothiazide	1-0-1	Blood pressure medication
ZOQ70203	19237	Omeprazole	1-0-1	Heartburn reliever
NULL	NULL	NULL	NULL	NULL

10. **Appointment Table**: This table schedules appointments for patients with doctors, recording the appointment time, reason for the visit, and linking to the corresponding doctor.

AppointmentID	DoctorID	Appointment_Time	Reason
231014001	18759	2023-10-14 11:30:00	Accident
231014002	18756	2023-10-14 16:00:00	Skin Burn
231115001	19237	2023-11-15 14:30:00	Fever, Headache
231115002	20142	2023-11-15 13:30:00	Eye sight related
231115003	19187	2023-11-15 15:20:00	severe Headache
231115004	19456	2023-11-15 16:10:00	Constipation, Cough
231116001	19237	2023-11-16 10:30:00	Dizziness, Vomitting
231119001	19237	2023-11-19 14:30:00	Fever, Cold and Cough
231120001	17845	2023-11-20 12:00:00	Mild Headache
231120002	19456	2023-11-20 14:00:00	Breathing difficulty
NULL	NULL	NULL	NULL

11. **Procedures Table**: This table documents medical procedures performed by doctors, including procedure details and timing, essential for tracking patient care.

ProcedureID	DoctorID	Procedure_Name	Description	Procedure_Time
ASD752	18756	X-Ray	create images of bones, internal organs, and ot...	2023-10-14 16:00:00
EDG789	18759	Endoscopy	Insertion of a thin, flexible tube with a camera i...	2023-10-14 11:30:00
ERW752	19237	Appendectomy	Removal of the appendix, a small finger-shaped...	2023-11-16 10:30:00
MLN123	19237	Biopsy	Removal of a small sample of tissue for examina...	2023-11-15 14:30:00
MUN901	19187	MRI	uses radio waves and a large magnet to produc...	2023-11-15 15:20:00
PAZ730	19237	Ultrasound	uses sound waves to produce images of structu...	2023-11-19 14:30:00
PLM702	20142	CT	identify disease or injury within various regions ...	2023-11-15 13:30:00
POI785	19456	Cholecystectomy	Removal of the gallbladder, a small organ that s...	2023-11-20 14:00:00
QPR725	19456	Angioplasty	Insertion of a balloon or stent to open up narro...	2023-11-15 16:10:00
QTR453	17845	Cataract Surgery	Replacement of the clouded lens of the eye wit...	2023-11-20 12:00:00
NULL	NULL	NULL	NULL	NULL

12. **Patient Table**: This is a comprehensive table that stores personal information about patients, including their demographics, contact details, assigned doctor, medications, appointments, procedures, and insurance policy information.

PatientID	First_Name	Last_Name	Address	Phone_Number	Email	D_O_B	DoctorID	MedicationID	AppointmentID	ProcedureID	NurseID	Policy_No	Room_No	Ward_No
23101	Abhilash	Antony	123 Main Street, Anytown, USA	9876543212	abhilashantony@gmail.com	2000-05-31	19237	GEN75896	231115001	MLN123	21015	UNH146	NULL	1001
23102	Honey	Rose	789 Oak Street, Anytown, USA	9563214567	honeyrose@gmail.com	1996-11-25	18756	KFT72851	231014002	ASD752	20456	PDL456	NULL	1003
23103	Jisna	Joseph	1234 Pine Street, Anytown, USA	9012789456	jisnajoseph@gmail.com	1992-01-01	17845	VTG46259	231120001	QTR453	21259	BSH732	NULL	1005
23104	Liya	Thomas	9012 Birch Street, Anytown, USA	9127891245	liyathomas@gmail.com	1989-12-25	20142	RFS25830	231115002	PLM702	21963	ZRI702	NULL	1007
23105	Naveen	Sebastian	67890 Walnut Street, Anytown, USA	9234578564	naveensebastian@gmail.com	2002-11-25	19237	POS85325	231119001	PAZ730	21563	SBI734	NULL	1010
23111	Hanna	Hamna	456 Elm Street, Anytown, USA	9543219878	hannahamna@gmail.com	1995-10-15	18759	GNM72458	231014001	EDG789	20185	MTL785	201	NULL
23112	Jeremiah	Buckette	1011 Maple Street, Anytown, USA	9154567856	jeremiahbuckette@gmail.com	2001-03-26	19237	ABT72586	231116001	ERW752	22016	ALZ192	203	NULL
23113	Kevin	Karthik	5678 Cedar Street, Anytown, USA	9072957485	kevinkarthik@gmail.com	1999-07-18	19456	FJN72583	231120002	POI785	22865	CBL432	205	NULL
23114	Midhun	Murali	12345 Willow Street, Anytown, USA	9784562648	midhunmurali@gmail.com	1996-03-01	19187	SLM74156	231115003	MUN901	21123	LIC425	207	NULL
23115	Sanjoe	Baby	111222 Elm Street, Anytown, USA	900124512	sanjoebaby@gmail.com	2001-09-23	19456	ZOQ70203	231115004	QPR725	21191	NIA025	210	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

The SQL code for creating these tables, along with the corresponding sample data insertion commands, is available in the GitHub repository associated with this project. This repository serves as a resource for reviewing the implementation details and understanding the structure of the database.

Querying the Database…

➢ This query retrieves the full name, salary, and department of the staff member with the lowest salary.

```
SELECT CONCAT(first_name, ' ', last_name) AS Name, Salary, Department_name AS
Dept
FROM staff WHERE salary = (SELECT MIN(salary) FROM staff);
```

Name	Salary	Dept
Saji Jaison	20000	OB/GYN

➢ This query lists the details of patients assigned to Dr. Anusha, sorted by the patient's name.

```
SELECT concat(first_name, ' ', last_name) AS Name, d_o_b, Phone_Number
FROM patient p
WHERE doctorid = (SELECT doctorid FROM doctor d WHERE first_name = 'Anusha')
ORDER BY Name;
```

Name	d_o_b	Phone_Number
Abhilash Antony	2000-05-31	9876543212
Jeremiah Buckette	2001-03-26	9154567856
Naveen Sebastian	2002-11-25	9234578564

➢ This query retrieves the names, positions, and salaries of staff members in the "Ophthalmology" department who earn above the average salary for that department.

```
SELECT concat(first_name, ' ', last_name) as Name, Position, Salary FROM staff
WHERE salary > (SELECT AVG(salary)
FROM staff
WHERE department_name = staff.department_name GROUP BY department_name having
department_name = 'Ophthalmology');
```

Name	Position	Salary
Jais Binoy	Physical Therapist	55000

➢ This query selects the names, positions, salaries, and department names of staff members who earn above the average salary for their respective departments.

```
select concat(first_name, ' ', last_name) as Name, Position, Salary,
Department_name as Dept
from staff s where salary > (select avg(salary) from staff where
department_name = s.department_name);
```

Name	Position	Salary	Dept
Bibin Samuel	Dietitian	45000	Internal Medicine
Malavika Biju	Ultrasonographer	35000	OB/GYN
Jais Binoy	Physical Therapist	55000	Orthopedics

➢ This query retrieves the names, department names, and phone numbers of nurses who are also head nurses in their respective wards.

```
select concat(first_name, ' ', last_name) as Nurse_Name, Department_Name as
Department, Phone_Number
from nurse n where n.NurseID in (select head_Nurse_ID from ward w where
w.head_nurse_id = n.NurseID);
```

Nurse_Name	Department	Phone_Number
Rafeeq Riyas	Internal Medicine	8574859645
Rajesh Rahul	Internal Medicine	7538642565
Fathima Riyas	Padiatrics	9236021542
Namitha Catherine	Surgical Department	7418526548
Ushas Thomas	Padiatrics	9465823545
Sandra Johns	OB/GYN	9685742310
Rijo Rajeev	Surgical Department	8527419635
Reena Robin	OB/GYN	7539512688

➢ This query selects the names and salaries of staff members whose salaries are less than the minimum salary of any department.

```
select concat(first_name, ' ', last_name) as Staff_Name, Salary from Staff
where salary < any(select min(salary) from staff group by department_name);
```

Staff_Name	Salary
Anjana John	30000
Aaron Bloke	30000
Saji Jaison	20000
Malavika Biju	35000
Pamy Sebastian	30000
Vismaya Biju	40000
Daniya Deepak	42000

➢ This query retrieves department names and the total salaries of staff in each department, filtering to include only those departments where the total salary exceeds 35,000.

```
select department_name, sum(salary) as salary
from staff group by department_name
having salary in (select salary from staff where salary > 35000);
```

department_name	salary
OB/GYN	55000
Ophthalmology	45000

➢ This query selects all columns from a derived table that includes first names, last names, and phone numbers of patients born before January 1, 2000.

```
select * from (select First_Name, Last_Name, Phone_Number
from Patient p where p.D_O_B < '2000-01-01') as Patient_Bday;
```

First_Name	Last_Name	Phone_Number
Honey	Rose	9563214567
Jisna	Joseph	9012789456
Liya	Thomas	9127891245
Hanna	Hamna	9543219878
Kevin	Karthik	9072957485
Midhun	Murali	9784562648

➢ This query retrieves distinct first names of patients along with the first names of their corresponding nurses, linking them through the `NurseID`.

```sql
select distinct First_Name as Patient_Name,
(select First_Name from Nurse n where n.NurseID = p.NurseID) as Nurse_Name
from Patient p;
```

Patient_Name	Nurse_Name
Abhilash	Delbin
Honey	Rajesh
Jisna	Namitha
Liya	Sandra
Naveen	Ushas
Hanna	Rafeeq
Jeremiah	Rijo
Kevin	Reena
Midhun	Saniya
Sanjoe	Fathima

➢ This query selects staff members whose salaries are greater than the average salary of their respective departments, displaying the results ordered by first name.

```sql
SELECT staffID, first_name, salary, department_name FROM staff s
WHERE salary > ALL (SELECT AVG(salary) FROM staff WHERE department_name =
s.department_name) order by first_name;
```

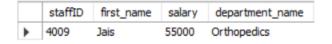| staffID	first_name	salary	department_name
4002	Bibin	45000	Internal Medicine
4009	Jais	55000	Orthopedics
4005	Malavika	35000	OB/GYN

➢ This query retrieves staff members who earn more than at least one other staff member in the same department.

```sql
SELECT staffID, first_name, salary, department_name FROM staff s1
WHERE EXISTS (SELECT 1 FROM staff s2 WHERE s2.department_name =
s1.department_name AND s2.salary < s1.salary);
```

staffID	first_name	salary	department_name
4002	Bibin	45000	Internal Medicine
4005	Malavika	35000	OB/GYN
4009	Jais	55000	Orthopedics
4010	Daniya	42000	Orthopedics

➢ This query selects staff members whose salaries are higher than the average salary of the highest-paid department.

```sql
SELECT staffID, first_name, salary, department_name FROM staff s
WHERE salary > (SELECT AVG(salary) FROM staff
WHERE department_name = (SELECT department_name FROM staff GROUP BY
department_name ORDER BY AVG(salary) DESC LIMIT 1)) order by first_name;
```

staffID	first_name	salary	department_name
4009	Jais	55000	Orthopedics

➢ This query retrieves all columns from the `patient_second` table and the `ward` table by performing an inner join based on the matching `Ward_No`.

```sql
select * from patient_second p inner join ward w on p.Ward_No = w.Ward_No;
```

First_Name	Last_Name	Phone_Number	DoctorID	Room_No	Ward_No	Ward_No	Ward_Name	Gender	Total_Beds	Beds_Available	Head_Nurse_ID
Abhilash	Antony	9876543212	19237	NULL	1001	1001	General Ward	Male	150	50	22865
Honey	Rose	9563214567	17886	NULL	1003	1003	Surgical Ward	Other	50	30	20456
Jisna	Joseph	9012789456	17845	NULL	1005	1005	Neurology Ward	Female	60	35	22016
Liya	Thomas	9127891245	75645	NULL	1007	1007	Pediatrics Ward	Female	150	50	21259
Naveen	Sebastian	9234578564	19237	NULL	1010	1010	Psychiatric Ward	Male	80	60	21191

➢ This query performs Full Outer Join by combining the results of a left outer join and a right outer join between the `doctor_second` table and the `department_second` table, returning all records from both tables where the department names match, along with unmatched records from both sides.

```sql
select * from doctor_second doc left outer join department_second dep on
doc.department_name = dep.department_name
UNION
select * from doctor_second doc right outer join department_second dep on
doc.department_name = dep.department_name;
```

DoctorID	First_Name	Last_Name	Department_name	Department_Name	HOD_First_Name	HOD_Last_Name	HOD_Phone_Number
17845	Aleena	Anna	Obstetrics	NULL	NULL	NULL	NULL
18756	Walter	White	Dermatology	Dermatology	Ushas	Devasia	8985847856
18759	Akshay	Krishna	General Surgery	NULL	NULL	NULL	NULL
18769	Lim	Nolan	Geriatrics	NULL	NULL	NULL	NULL
18965	Adam	Arnold	Orthopedics	Orthopedics	Jyothis	Devasia	9748956325
19187	Alfy	Shaju	Physiology	NULL	NULL	NULL	NULL
19237	Anusha	Shaju	Gynecology	NULL	NULL	NULL	NULL
19456	Shaun	Murphy	Internal Medicine	Internal Medicine	Ashok	Augustine	9854752615
19875	Jack	Ryan	Otolaryngology	NULL	NULL	NULL	NULL
20142	John	Justin	Ophthalmology	Ophthalmology	Arsha	Babu	9365874512
NULL	NULL	NULL	NULL	ENT	Rahul	Kesav	8986815245
NULL	NULL	NULL	NULL	Neurology	Thomas	Xavier	8086254535
NULL	NULL	NULL	NULL	OB/GYN	Alen	Blake	6854986541
NULL	NULL	NULL	NULL	Padiatrics	Edwin	Joshy	9594658515
NULL	NULL	NULL	NULL	Psychiatry	Nandhana	Krishna	8680854745
NULL	NULL	NULL	NULL	Surgical Department	Domina	Sebastian	9747982705

➢ This query retrieves the first names of nurses alongside the first names of their respective head nurses by performing a self-join on the `Nurse_second` table based on the `Head_nurse` ID.

```sql
select a.first_name as Emp_Name, b.first_name as Head_Name from Nurse_second a
join Nurse_second b on b.nurseID=a.Head_nurse;
```

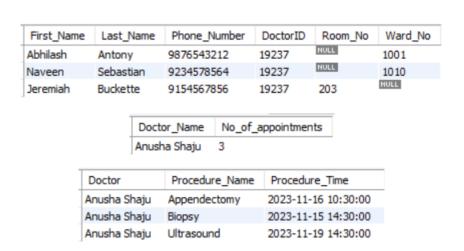| Emp_Name	Head_Name
Rafeeq	Rafeeq
Rajesh	Rafeeq
Delbin	Rafeeq
Saniya	Saniya
Fathima	Ushas
Namitha	Saniya
Ushas	Ushas
Sandra	Ushas
Rijo	Saniya
Reena	Saniya

- ➢ This code defines a stored procedure named `doctor_details`, which takes a doctor ID as an input parameter. The procedure performs three queries:
  1. It retrieves all records from the `patient_second` table for the specified doctor.
  2. It counts the number of appointments for that doctor and concatenates the doctor's first and last names.
  3. It retrieves the procedures associated with the doctor, including the procedure name and time.

```
drop procedure doctor_details;

delimiter $$
create procedure doctor_details(IN x INT)
begin
    select * from patient_second where DoctorID = x;
    select (select concat(d.First_Name,' ', d.Last_Name) from doctor d
    where doctorID = x) as Doctor_Name, count(a.doctorID) as
No_of_appointments
    from appointment a where a.doctorID = x;
    select concat(d.First_Name,' ', d.Last_Name) as Doctor, p.Procedure_Name,
p.Procedure_Time
    from doctor d, procedures p where d.DoctorID = x and p.DoctorID = x;
end  $$
delimiter ;

call doctor_details(19237);
```

First_Name	Last_Name	Phone_Number	DoctorID	Room_No	Ward_No
Abhilash	Antony	9876543212	19237	NULL	1001
Naveen	Sebastian	9234578564	19237	NULL	1010
Jeremiah	Buckette	9154567856	19237	203	NULL

Doctor_Name	No_of_appointments
Anusha Shaju	3

Doctor	Procedure_Name	Procedure_Time
Anusha Shaju	Appendectomy	2023-11-16 10:30:00
Anusha Shaju	Biopsy	2023-11-15 14:30:00
Anusha Shaju	Ultrasound	2023-11-19 14:30:00

- ➢ This code defines a trigger named `salary_update` that activates after an insert operation on the `staff` table. The trigger performs two actions:

  1. It deletes all records from the `salary_expense` table.
  2. It inserts a new record into the `salary_expense` table containing the total salary, the count of staff members, and the average salary calculated from the `staff` table.

Table staff b4 insertion:

StaffID	First_Name	Last_Name	Position	Salary	Phone_Number	Email	Department_Name
4001	Anjana	John	Physician Assistant	30000	9895963625	anjanajohn@stjohns.com	Internal Medicine
4002	Bibin	Samuel	Dietitian	45000	9784585965	bibinsamuel@stjohns.com	Internal Medicine
4003	Aaron	Bloke	Social Worker	30000	9794658515	aaronbloke@stjohns.com	Internal Medicine
4004	Saji	Jaison	Midwife	20000	9545678912	sajijaison@stjohns.com	OB/GYN
4005	Malavika	Biju	Ultrasonographer	35000	9897596865	malavikabiju@stjohns.com	OB/GYN
4006	Pamy	Sebastian	Dermatologic surgeon	30000	6832659845	pamysebastian@stjohns.com	Dermatology
4007	Celin	Charlie	Optometrist	45000	6865623545	celincharlie@stjohns.com	Ophthalmology
4008	Vismaya	Biju	Physiatrist	40000	6265784512	vismayabiju@stjohns.com	Orthopedics
4009	Jais	Binoy	Physical Therapist	55000	9865784512	jaisbinoy@stjohns.com	Orthopedics
4010	Daniya	Deepak	Prosthetist	42000	8684759625	daniyadeepak@stjohns.com	Orthopedics

Table salary_expense before insertion:

total_salary	total_staff	average_salary
372000	10	37200.00

```
SET SQL_SAFE_UPDATES = 0;

delimiter $$
create trigger salary_update after insert on staff
for each row
begin
    delete from salary_expense;
    insert into salary_expense select sum(salary), count(*),
sum(salary)/count(*) from staff;
end $$
delimiter ;

INSERT INTO Staff(First_Name, Last_Name, Position, Salary, Phone_Number,
Email, Department_Name)
VALUES
('Angel', 'anna', 'Radiologist', 250000, '9895754625',
'angelanna@stjohns.com', 'Radiology');
```

Table Staff after the insertion

StaffID	First_Name	Last_Name	Position	Salary	Phone_Number	Email	Department_Name
4001	Anjana	John	Physician Assistant	30000	9895963625	anjanajohn@stjohns.com	Internal Medicine
4002	Bibin	Samuel	Dietitian	45000	9784585965	bibinsamuel@stjohns.com	Internal Medicine
4003	Aaron	Bloke	Social Worker	30000	9794658515	aaronbloke@stjohns.com	Internal Medicine
4004	Saji	Jaison	Midwife	20000	9545678912	sajijaison@stjohns.com	OB/GYN
4005	Malavika	Biju	Ultrasonographer	35000	9897596865	malavikabiju@stjohns.com	OB/GYN
4006	Pamy	Sebastian	Dermatologic surgeon	30000	6832659845	pamysebastian@stjohns.com	Dermatology
4007	Celin	Charlie	Optometrist	45000	6865623545	celincharlie@stjohns.com	Ophthalmology
4008	Vismaya	Biju	Physiatrist	40000	6: 6865623545	vismayabiju@stjohns.com	Orthopedics
4009	Jais	Binoy	Physical Therapist	55000	9865784512	jaisbinoy@stjohns.com	Orthopedics
4010	Daniya	Deepak	Prosthetist	42000	8684759625	daniyadeepak@stjohns.com	Orthopedics
4012	Angel	anna	Radiologist	250000	9895754625	angelanna@stjohns.com	Radiology

Table Salary Expense after the insertion

total_salary	total_staff	average_salary
622000	11	56545.45

> ➢ This below portion outlines a series of SQL operations executed within a stored procedure named `monthly_changes`, which updates staff salaries, deletes specific doctors and their phone records, modifies room statuses and rents, and inserts new appointment records, with the ability to revert changes to specific points in the process using save points for transaction control.

Doctor Table before:

DoctorID	First_Name	Last_Name	Specialization	Email	Department_Name
17845	Aleena	Anna	Obstetrics	aleenaanna@stjohns.com	OB/GYN
18756	Walter	White	Dermatologist	walterwhite@stjohns.com	Dermatology
18759	Akshay	Krishna	General Surgen	akshaykrishna@stjohns.com	Surgical Department
18769	Lim	Nolan	Psychiatrist	limnolan@stjohns.com	Psychiatry
18965	Adam	Arnold	Orthopedist	adamarnold@stjohns.com	Orthopedics
19187	Alfy	Shaju	Neurologist	alfykshaju@stjohns.com	Neurology
19237	Anusha	Shaju	Gynecologist	anushakshaju@stjohns.com	OB/GYN
19456	Shaun	Murphy	General Medicine	shaunmurphy@stjohns.com	Internal Medicine
19875	Jack	Ryan	Otolaryngologist	jackryan@stjohns.com	ENT
20142	John	Justin	Ophthalmologist	johnjustin@stjohns.com	Ophthalmology
NULL	NULL	NULL	NULL	NULL	NULL

Doctor_Phone Table before:

DoctorID	Phone_No
19456	9895963625
18759	9785456525
19237	8086574595
18756	9695784515
17845	8685487885
20142	8485896585
18965	9895969475
19875	9593924575
18769	9096351625
19187	9589952125

Staff Table before:

StaffID	FIrst_Name	Last_Name	Position	Salary
4001	Anjana	John	Physician Assistant	30000
4002	Bibin	Samuel	Dietitian	45000
4003	Aaron	Bloke	Social Worker	30000
4004	Saji	Jaison	Midwife	20000
4005	Malavika	Biju	Ultrasonographer	35000
4006	Pamy	Sebastian	Dermatologic surgeon	30000
4007	Celin	Charlie	Optometrist	45000
4008	Vismaya	Biju	Physiatrist	40000
4009	Jais	Binoy	Physical Therapist	55000
4010	Daniya	Deepak	Prosthetist	42000
NULL	NULL	NULL	NULL	NULL

Room Table before:

Room_No	Room_Type	Rent_Per_Day	Occupancy_Status	Television
201	Normal	1000	Occupied	0
202	Normal	1000	Occupied	0
203	Deluxe	2500	Occupied	1
204	Deluxe	2500	Vacant	1
205	Deluxe	2500	Occupied	1
206	Premium Deluxe	4500	Vacant	1
207	Premium Deluxe	4500	Occupied	1
208	Premium Deluxe	4500	Vacant	1
209	Normal	1000	Vacant	0
210	Deluxe	2500	Occupied	1
NULL	NULL	NULL	NULL	NULL

Appointment Table before:

AppointmentID	DoctorID	Appointment_Time	Reason
231014001	18759	2023-10-14 11:30:00	Accident
231014002	18756	2023-10-14 16:00:00	Skin Burn
231115001	19237	2023-11-15 14:30:00	Fever, Headache
231115002	20142	2023-11-15 13:30:00	Eye sight related
231115003	19187	2023-11-15 15:20:00	severe Headache
231115004	19456	2023-11-15 16:10:00	Constipation, Cough
231116001	19237	2023-11-16 10:30:00	Dizziness, Vomitting
231119001	19237	2023-11-19 14:30:00	Fever, Cold and Cough
231120001	17845	2023-11-20 12:00:00	Mild Headache
231120002	19456	2023-11-20 14:00:00	Breathing difficulty
NULL	NULL	NULL	NULL

Queries…

```
SET autocommit = 0;
```

Auto-commit mode means that when a statement is completed, the method commit is called on that statement automatically. Auto-commit in effect makes every SQL statement a transaction. The commit occurs when the statement completes or the next statement is executed, whichever comes first. If autocommit is disabled, the session ends without committing the final transaction, enabling MySQL roll back that transaction if needed.

```
DROP PROCEDURE monthly_changes;

delimiter $$
CREATE PROCEDURE monthly_changes()
BEGIN
    savepoint SP_1;
    UPDATE staff SET Salary = salary + salary*0.2 WHERE salary >30000;
    savepoint SP_2;
    DELETE d.*, dp.* FROM Doctor d INNER JOIN Doctor_Phone dp ON d.DoctorID =
dp.DoctorID
    WHERE d.DoctorID IN ('19237', '17845', '20142', '18965');
    savepoint SP_3;
    UPDATE Room SET Occupancy_Status = 'Vacant' WHERE Room_No IN (207,202);
    savepoint SP_4;
    UPDATE Room SET Rent_Per_Day = Rent_Per_Day + 500 WHERE Room_Type IN
('Deluxe', 'Premium Deluxe');
    savepoint SP_5;
    INSERT INTO Appointment VALUES
    ('240110001', '18759', '2024-01-10 14:30:00', 'Fever, Headache'),
    ('240109001', '18759', '2024-01-09 11:30:00', 'Accident'),
    ('240110002', '19187', '2024-01-10 16:00:00', 'Fits'),
    ('240102001', '19456', '2024-01-02 10:30:00', 'Dizziness, Vomitting');
END $$
delimiter ;

CALL monthly_changes();
```

Doctor Table After:

DoctorID	First_Name	Last_Name	Specialization	Email	Department_Name
18756	Walter	White	Dermatologist	walterwhite@stjohns.com	Dermatology
18759	Akshay	Krishna	General Surgen	akshaykrishna@stjohns.com	Surgical Department
18769	Lim	Nolan	Psychiatrist	limnolan@stjohns.com	Psychiatry
19187	Alfy	Shaju	Neurologist	alfykshaju@stjohns.com	Neurology
19456	Shaun	Murphy	General Medicine	shaunmurphy@stjohns.com	Internal Medicine
19875	Jack	Ryan	Otolaryngologist	jackryan@stjohns.com	ENT
NULL	NULL	NULL	NULL	NULL	NULL

Doctor_Phone Table After:

DoctorID	Phone_No
19456	9895963625
18759	9785456525
18756	9695784515
19875	9593924575
18769	9096351625
19187	9589952125

Here, Details of four Doctors has been erased from the relations Doctor and Doctor_Phone.

Staff Table After:

StaffID	FIrst_Name	Last_Name	Position	Salary
4001	Anjana	John	Physician Assistant	30000
4002	Bibin	Samuel	Dietitian	54000
4003	Aaron	Bloke	Social Worker	30000
4004	Saji	Jaison	Midwife	20000
4005	Malavika	Biju	Ultrasonographer	42000
4006	Pamy	Sebastian	Dermatologic surgeon	30000
4007	Celin	Charlie	Optometrist	54000
4008	Vismaya	Biju	Physiatrist	48000
4009	Jais	Binoy	Physical Therapist	66000
4010	Daniya	Deepak	Prosthetist	50400
NULL	NULL	NULL	NULL	NULL

Here, the Salary of the staffs earning more than 30K have been hiked by 20%.

Room Table After:

Room_No	Room_Type	Rent_Per_Day	Occupancy_Status	Television
201	Normal	1000	Occupied	0
202	Normal	1000	Vacant	0
203	Deluxe	3000	Occupied	1
204	Deluxe	3000	Vacant	1
205	Deluxe	3000	Occupied	1
206	Premium Deluxe	5000	Vacant	1
207	Premium Deluxe	5000	Vacant	1
208	Premium Deluxe	5000	Vacant	1
209	Normal	1000	Vacant	0
210	Deluxe	3000	Occupied	1
NULL	NULL	NULL	NULL	NULL

Here, Two major changes have been brought. First, the rooms 207 and 202 have been marked 'vacant' from 'Occupied'. Then, the rent_per_day of the rooms of the types 'Deluxe' and 'Premium Deluxe' have been increased by 500.

Appointment Table After:

AppointmentID	DoctorID	Appointment_Time	Reason
231014001	18759	2023-10-14 11:30:00	Accident
231014002	18756	2023-10-14 16:00:00	Skin Burn
231115001	19237	2023-11-15 14:30:00	Fever, Headache
231115002	20142	2023-11-15 13:30:00	Eye sight related
231115003	19187	2023-11-15 15:20:00	severe Headache
231115004	19456	2023-11-15 16:10:00	Constipation, Cough
231116001	19237	2023-11-16 10:30:00	Dizziness, Vomitting
231119001	19237	2023-11-19 14:30:00	Fever, Cold and Cough
231120001	17845	2023-11-20 12:00:00	Mild Headache
231120002	19456	2023-11-20 14:00:00	Breathing difficulty
240102001	19456	2024-01-02 10:30:00	Dizziness, Vomitting
240109001	18759	2024-01-09 11:30:00	Accident
240110001	18759	2024-01-10 14:30:00	Fever, Headache
240110002	19187	2024-01-10 16:00:00	Fits
NULL	NULL	NULL	NULL

Here, 4 more rows are added.

Save point Demonstrations…

```sql
ROLLBACK TO SAVEPOINT SP_5;
SELECT * FROM Appointment;
```

AppointmentID	DoctorID	Appointment_Time	Reason
231014001	18759	2023-10-14 11:30:00	Accident
231014002	18756	2023-10-14 16:00:00	Skin Burn
231115001	19237	2023-11-15 14:30:00	Fever, Headache
231115002	20142	2023-11-15 13:30:00	Eye sight related
231115003	19187	2023-11-15 15:20:00	severe Headache
231115004	19456	2023-11-15 16:10:00	Constipation, Cough
231116001	19237	2023-11-16 10:30:00	Dizziness, Vomitting
231119001	19237	2023-11-19 14:30:00	Fever, Cold and Cough
231120001	17845	2023-11-20 12:00:00	Mild Headache
231120002	19456	2023-11-20 14:00:00	Breathing difficulty
NULL	NULL	NULL	NULL

Upon Rollback to savepoint SP_4, the newly added tuples of the relation Appointment are removed.

```sql
ROLLBACK TO SAVEPOINT SP_4;
SELECT * FROM Room;
```

Room_No	Room_Type	Rent_Per_Day	Occupancy_Status	Television
201	Normal	1000	Occupied	0
202	Normal	1000	Vacant	0
203	Deluxe	2500	Occupied	1
204	Deluxe	2500	Vacant	1
205	Deluxe	2500	Occupied	1
206	Premium Deluxe	4500	Vacant	1
207	Premium Deluxe	4500	Vacant	1
208	Premium Deluxe	4500	Vacant	1
209	Normal	1000	Vacant	0
210	Deluxe	2500	Occupied	1
NULL	NULL	NULL	NULL	NULL

Here, upon rollback to savepoint sp_4, the rent_per_day is reduced by 500.

```sql
ROLLBACK TO SAVEPOINT SP_3;
SELECT * FROM Room;
```

Room_No	Room_Type	Rent_Per_Day	Occupancy_Status	Television
201	Normal	1000	Occupied	0
202	Normal	1000	Occupied	0
203	Deluxe	2500	Occupied	1
204	Deluxe	2500	Vacant	1
205	Deluxe	2500	Occupied	1
206	Premium Deluxe	4500	Vacant	1
207	Premium Deluxe	4500	Occupied	1
208	Premium Deluxe	4500	Vacant	1
209	Normal	1000	Vacant	0
210	Deluxe	2500	Occupied	1
NULL	NULL	NULL	NULL	NULL

Here, upon rollback to savepoint sp_3, the rooms 207 and 202 are again marked 'Occupied'.

```sql
ROLLBACK TO SAVEPOINT SP_2;
SELECT * FROM Doctor;
```

DoctorID	First_Name	Last_Name	Specialization	Email	Department_Name
17845	Aleena	Anna	Obstetrics	aleenaanna@stjohns.com	OB/GYN
18756	Walter	White	Dermatologist	walterwhite@stjohns.com	Dermatology
18759	Akshay	Krishna	General Surgen	akshaykrishna@stjohns.com	Surgical Department
18769	Lim	Nolan	Psychiatrist	limnolan@stjohns.com	Psychiatry
18965	Adam	Arnold	Orthopedist	adamarnold@stjohns.com	Orthopedics
19187	Alfy	Shaju	Neurologist	alfykshaju@stjohns.com	Neurology
19237	Anusha	Shaju	Gynecologist	anushakshaju@stjohns.com	OB/GYN
19456	Shaun	Murphy	General Medicine	shaunmurphy@stjohns.com	Internal Medicine
19875	Jack	Ryan	Otolaryngologist	jackryan@stjohns.com	ENT
20142	John	Justin	Ophthalmologist	johnjustin@stjohns.com	Ophthalmology
NULL	NULL	NULL	NULL	NULL	NULL

```
SELECT * FROM Doctor_Phone;
```

DoctorID	Phone_No
19456	9895963625
18759	9785456525
19237	8086574595
18756	9695784515
17845	8685487885
20142	8485896585
18965	9895969475
19875	9593924575
18769	9096351625
19187	9589952125

Here, upon rollback to savepoint sp_2, the removed tuples from both the relations 'Doctor' and 'Doctor_phone' are inserted again.

```
ROLLBACK TO SAVEPOINT SP_1;
SELECT * FROM Staff;
```

StaffID	FIrst_Name	Last_Name	Position	Salary
4001	Anjana	John	Physician Assistant	30000
4002	Bibin	Samuel	Dietitian	45000
4003	Aaron	Bloke	Social Worker	30000
4004	Saji	Jaison	Midwife	20000
4005	Malavika	Biju	Ultrasonographer	35000
4006	Pamy	Sebastian	Dermatologic surgeon	30000
4007	Celin	Charlie	Optometrist	45000
4008	Vismaya	Biju	Physiatrist	40000
4009	Jais	Binoy	Physical Therapist	55000
4010	Daniya	Deepak	Prosthetist	42000
NULL	NULL	NULL	NULL	NULL

Here, the Salary of the staffs earning more than 30K have been reduced by 20% as it was before.

If the COMMIT was not disabled, the transactions would not be reversible. The savepoints will not be saved.

Conclusions...

In conclusion, my internship at Brainwave Matrix Solutions provided a valuable and transformative experience, emphasizing the critical importance of effective database management in the healthcare sector. Throughout the project, I successfully demonstrated how leveraging SQL techniques and structured database design can significantly improve data handling processes, ensuring accurate, timely, and efficient access to essential information.

The implementation of savepoints, stored procedures, and triggers within the Hospital Management System not only facilitated complex transaction management but also enhanced data integrity and reliability. For instance, the use of savepoints allowed for targeted rollbacks to specific states within a transaction, thereby safeguarding data accuracy and minimizing potential errors during updates or deletions. Additionally, the creation of stored procedures streamlined repetitive tasks, reducing the risk of errors and improving overall system performance.

This experience has not only reinforced my technical skills in database management but has also provided me with a deeper understanding of the intricate relationship between data systems and healthcare operations. As I reflect on the insights gained during this internship, I recognize their value in shaping my future career in database management and data analytics. I am now better equipped to approach complex data challenges with a strategic mindset, understanding the nuances of designing systems that meet the dynamic needs of healthcare environments. Ultimately, the skills and knowledge acquired during this internship will serve as a strong foundation as I continue my journey in the field of data management and its application in enhancing healthcare delivery.