CPCS241-Database I-Spring2022-Project

Happy Smile Clinic

DB Design

Contents

PART I: Analysis

1 Problem Definition and Data Requirements

1.1 Problem Description

Like all medical centres, clinics need a management system that organizes and controls their services. Using a well-organized database management system is helpful to avoid delays and deal professionally with patients.

Happy Smile dental clinic has a system, which we design while we try to cover the entire needs of the clinic and its requirements. In clinics, there are main sections and sub-sections that meet the needs of clinic management and patients as well. In our clinic, there are basic categories that are important to be included in the database management system, such as employees, patient, reception and other well-known services departments. All these categories are a part of the database with other extra departments. A powerful database management system is one of the standards of a business's success .

How the Happy smile database system works :

The patient goes to the reception to record their data, then she/he chooses the doctor she/ he wants to see based on the appropriate treatment. The patient has to pay the bill, before meeting the doctor. The prices are varied according to the type of treatment used and different doctors. After the appointment ends, the doctor creates the prescription, adds it to the system, then give it to the patient. Then the patient can book for the next appointment at the reception. The clinic reception plays a huge role in managing all the business between doctors and patients.

1.2 Data Requirements

Employee

Each employee has:

- id: a unique id.
- Name: a composite attribute consists of first name (Fname), middle name (Mname), last name (Lname).
- birthDate: date of birth of the employee.
- Job_type: employee can be a doctor, nurse, or receptionist.
- Gender: employee can be Female or Male.
- phone: the phone number of the employee.
- workingHours: monthly working hours entered every month.
- Rateperhour: each employee has a rate per hour.

Patient

Each patient has:
- PatientID: a unique id.
- Name: a composite attribute consists of first name (Fname), middle name (Mname), last name (Lname).
- Date_Birth: date of birth of the employee.
- Gender: employee can be Female or Male.
- Phone: the phone number of the employee.

Treatment

Each treatment has:
- Tname: a unique name describes the treatment
- Cost: the cost of treatment, and what doctor the patient chooses.

Prescription

Each prescription has:
- Prcode: a unique code number.
- Pdate: the date when the prescription has been written.

Medicine information

Each medicine has:
- Mname: a unique name
- Description: a description of the medicine.
- Cost: cost of the medicine

Reception

Each recaption has:
- Rcode: a unique code number.
- Floor: the floor where the reception is located.

Appointment

Each appointment has:
- Apcode: a unique code number.
- Apdate: date of the appointment.

Bill

Each bill has:
- Bcode: a unique code number
- Bdate: date of the bill.
- totalCost: cost of the chosen treatments of which doctor.
- paymentMethod: payment method is either cash, online, or insurance.

Payroll

Each payroll has:
- Pcode: a unique code number.

- Deduction: deduction to the employee's salary when the employee working hours decreases.
- GOSI: 5% of each month salary, after deduction or over time hours, goes to the GOSI.
- Net_pay: calculate the net pay.

Leave

Each payroll has:
- LCode: a unique code number.
- Days: number of days.
- fromDate: leave starting date.
- toDate: leave ending date.
- reason: reason of employee leave application.

WorkingHour

Each WorkingHour record has:
- WHCode: a unique code number.
- Overtime: overtime hours for each employee every month.
- Monthly_workingHours: each employee has constant working hours.
- Date: date of the assigning the WorkingHour record for each employee.

1.3 Business Rules

Our system has a lot of business rules that must be followed, as follows:

Employee:

- Every employee like a doctor, nurse, or receptionist must enter or leave the clinic by scanning their IDs**.**
- Each employee must have a unique id.
- The doctor can receive many appointments from many patients.
- Each doctor has one nurse.
- Each employee has one direct supervisor.

Patient:

- Patients can book many appointments with one or more doctors in the clinic.
- Each patient is treated by one or more doctors and each doctor offers types of treatment.
- Each patient must have a unique identification number on file.
- Each patient pays his bill at the reception.
- Each patient records his data at the reception before booking an appointment.

Treatment:

- Every treatment must have a unique code.
- Treatments are be offered by many doctors.

Appointments:

- Each appointment is only for one doctor and one patient.
- A doctor cannot treat a patient without making an appointment.
- A patient cannot make an appointment without a file.
- Appointments are created by the receptionist only.

Prescription:

- The prescription should be written by your doctor.
- A prescription contains a list of the medicine information.

Reception:

- On the first visit of the patient, a file must be opened by the receptionist to record patient information.
- The patient's name, id, phone, sex, and birth date are recorded by a receptionist.
- A receptionist must create a bill for each patient.
- A receptionist must create an appointment. Then the patient books the appointment, and the doctor is assigned to the appointment.

Bill:

- Each bill must calculate the total cost for each patient.
- Each bill must calculate the cost of the type of treatment used and the cost of different specialists.
- A patient pays one or more bills, and each bill is paid by a patient.
- The patient must receive an invoice when paying.
- Payment methods at the clinic are cash, online, or insurance.

Leave:

- Management must provide annual leave to most paid employees.
- Employees must work for one year before they're entitled to Leave time.

WorkingHours:

- An employee's working hours are entered each month to calculates hers/his net pay.
- Each WorkingHour record has a date.
- Total Overtime of each employee is recorded each month

Payroll:

- Each employee will have his own payroll in which the the netpay and deductions will be calculated

Take_treatment:

- Each Patient will take a treatment from doctor
- Every doctor will write a treatment for a patient

1.4 Intended Output of the system

Transaction:

- Insert a new Employee into the system with a job title [doctors, nurses, receptionists]
- Insert/ Update Employee information such as [id, name, birthdate, job type, phone number].
- Insert/ Update Patient's information such as[id, Fname, Mname, Lname, Gender, birthdate, phoneNumber]
- Assign a receptionist to a specific floor.
- Create Appointments according to the employee schedule
- Assign appointments to the Employee
- Assign Dr to the Patient.
- Reservation (Books)/change appointments for the patient.
- Receiving the prescription from the doctor and sending it to the patient.
- Update an Appointment
- Update working hours and rate per hour for all employees in the system.
- Update health profile details [for employees and patients].
- Update bill total cost.
- Delete an Employee.
- Delete an appointment.

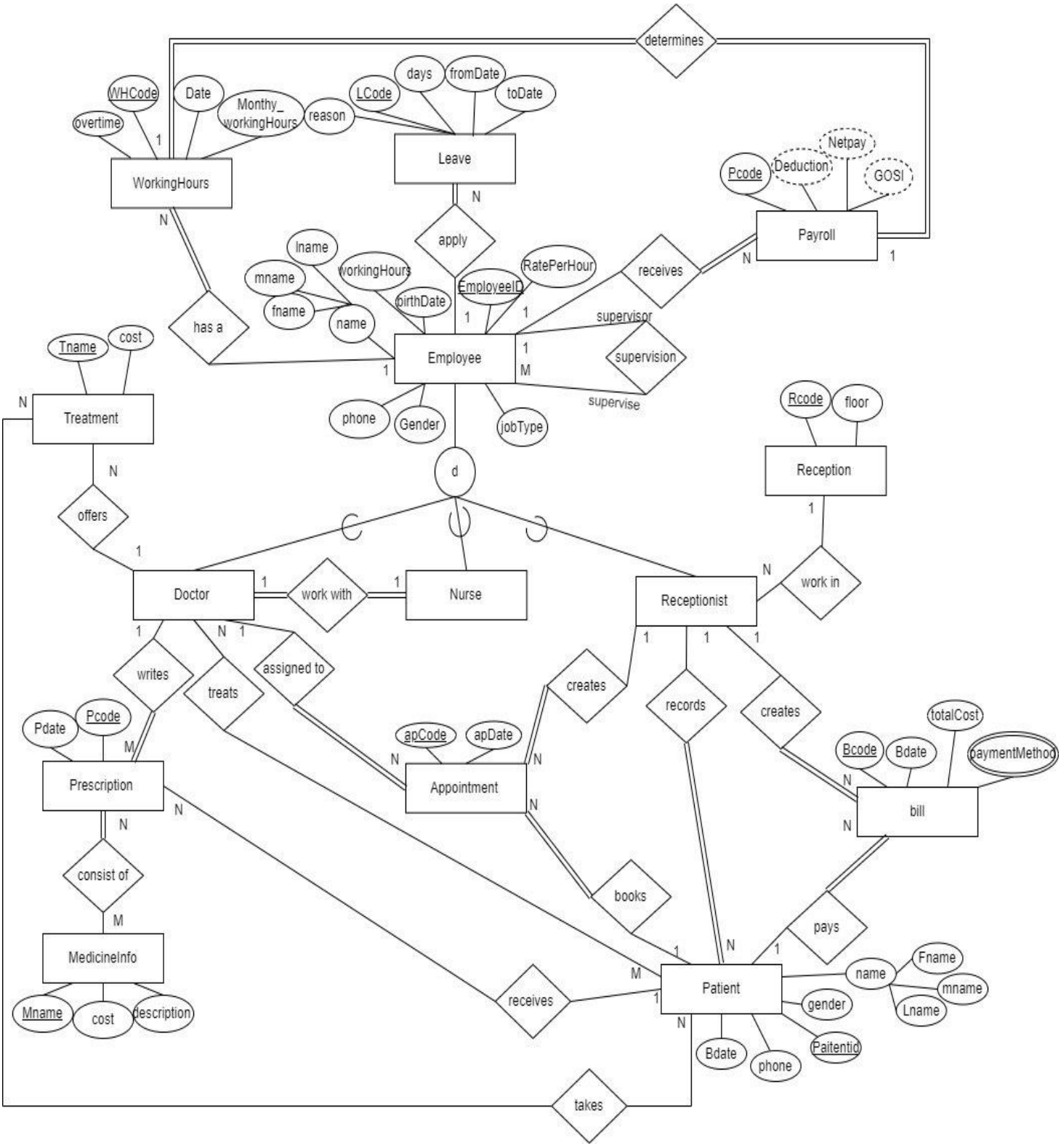
Queries and Output:

- Display all employees with the type of their job.
- Display bill details for each Patient.
- Display all receptionists with their floor number.
- Display health profile for each Employee and Patient
- Display appointments history and previous patient visits to the clinic
- Search for/Display available appointments.
- Search for an employee by ID.
- Search for a Patient by ID
- Issuing the medical prescription and method of treatment to the patient.
- Issuing bills to be paid.
- Issuing leaves to employees

PART II: DB DEISGN

2 ER Diagram Design

2.1 ER diagram



2.2 Design of Business Rules

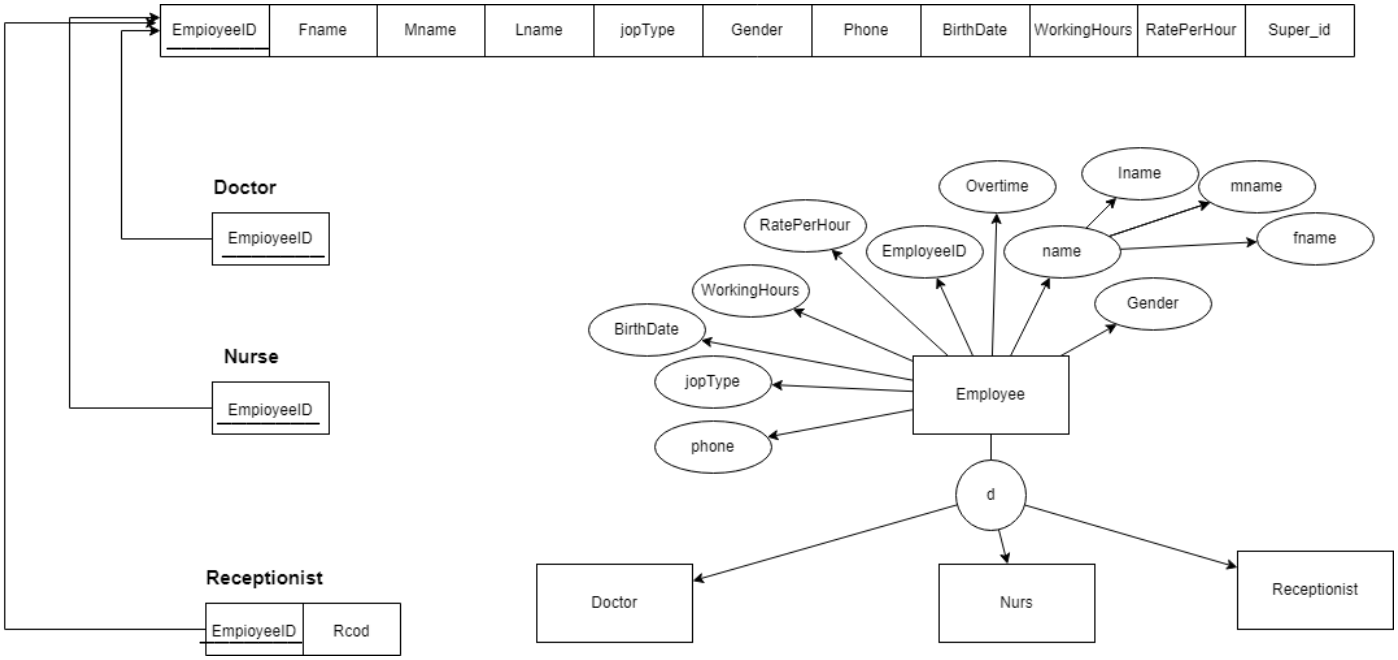
Business Rule	Design Decisions	Justification (if any)
There is a specialization for each employee	Super/subclass relationship with disjointedness and completeness constraints	for each employee only one specialization such that doctor, nurse, receptionist, and it is disjoint.
An employee has a one supervisor. A supervisor has many supervises.	1:N relationship between employee and itself	
Each Patient can visit several doctors by booking one or more appointments with one or several doctors.	M:N Binary relation between PATIENT and DOCTOR	The patient can visit one or several doctors at one appointment for each doctor, at different times.
Each doctor can treat several patients at different appointments.		
A doctor is assigned to an appointment.	1:N Binary relation between DOCTOR and APPOINTMENT	The appointment cannot be created without a doctor. Since all appointments are created to visit a doctor.
A patient books an appointment.	1:N Binary relation between PATIENT and APPOINTMENT	A patient can book as many appointments as she/he wants with many doctors.
Each nurse work with one doctor, and each doctor has one auxiliary nurse.	1:1 Binary relation between DOCTOR and NURSE	Since each nurse must work with one doctor, it is total participation from both sides because all doctors must own a nurse.
Each treatment and prescription are offered by many doctors.	1:N Binary relation between TREATMENT and DOCTOR	Since each treatment and each prescription is offered by the doctor to one patient.
	1:N Binary relation between PRESCRIPTION and DOCTOR	
A receptionist records patient information	1:N Binary relation between PRESCRIPTION and PATIENT.	Each patient opens a file and records his/her data at reception.
A prescription must contain one or more than one medicines information.	1:N Binary relation between PRESCRIPTION and MEDICINE_INFORMATION	Each prescription must have at least one medicine information for the patient. Since all prescriptions must contain a list of medicine information, it's total participation on the reservation side.

A receptionist works at reception.	1: N Binary relation between RECEPTION and RECEPTIONIST.	The clinic has receptions on each floor. Each reception has one or more receptionists.
A receptionist in the reception must create a bill for the patient.	1:N Binary relation between RECEPTIONIST and BILL	Since all patients have a treatment and may have a prescription, the receptionist must record this service in a bill for the patient to pay.
A receptionist in the reception must create an appointment for the patient.	1:N Binary relation between RECEPTIONIST and APPOINTMENT	Reception must create an appointment so that a patient can book it and assigned it a doctor.
A receptionist in the reception must records patient information.	1:N Binary relation between RECEPTIONIST and PATIENT	
Each bill for each patient calculates the total cost for all services (treatment, prescription)	1:N Binary relation between PATIENT and BILL	All the services are in the bill for the patient, also payment is made by the patient.
An employee applies for leaves.	1:N Binary relation between EMPLOYEE and LEAVE	All leaves are applied by the employees.
An employee receives a payroll.	1:N Binary relation between EMPLOYEE and PAYROLL	An employee receives the payroll that calculates the net pay.
An employee has a WorkingHours record.	1:N Binary relation between EMPLOYEE and WorkingHours	This relation record working hours and overtime records for each employee
The services that are applied to the patient are recorded in the bill to pay by the patient.	Total cost is a derived attribute.	Total cost is equal to the sum of all services taken by the patient (treatment, prescription, specialists)
The payroll follows some general rules to provide a monthly salary for each employee.	Net pay is a derived attribute.	Net pay is equal to the salary after Appling the deduction and GOSI.

3 ER-to-logical schema mapping

3.1 Mapping of Regular Entity Types

This is the general way to map the employee specialization.



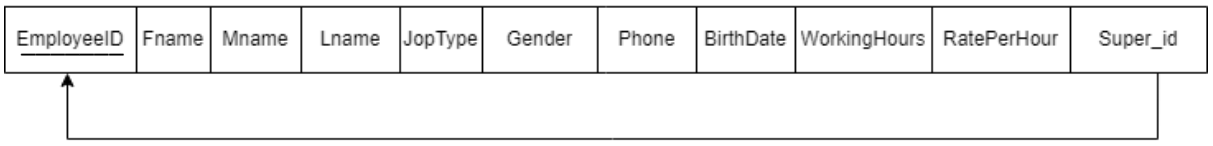
Mapping of regular entity is creating a new relation that includes all its attributes.

Then choosing primary key attributes for this relation.

3.2 Mapping of Weak Entity Types

Since all entities are regular, there is no mapping at this point.

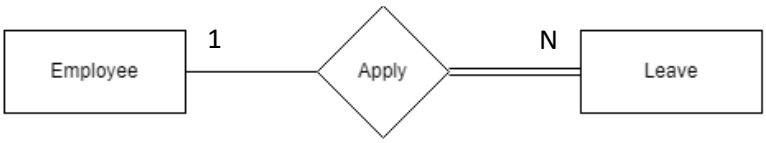
3.3 Mapping of binary 1-1 relationship types



The doctor supervising on nurse and all of doctors and nurses are specialization from employee, so it is circular relation that have super_id as foreign key referencing to EmployeeID as primary key in the same table EMPLOYEE.

3.4 Mapping of binary 1-N relationship types

To map the binary 1:N relationship, we include a foreign key on the N side.



Employee

EmployeeID	Fname	Mname	Lname	JopType	Gender	Phone	BirthDate	WorkingHours	RatePerHour	Super_id

Leave

Lcode	Reason	Days	FromDate	ToDate	Eid

- Include the primary key of EmployeeID as a foreign key Eid in Leave.

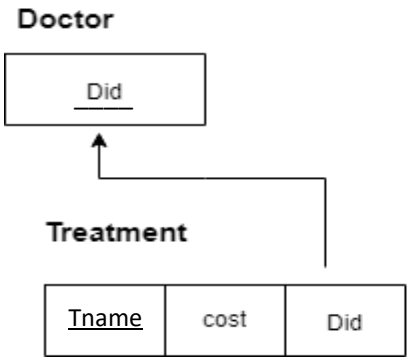
Doctor

Did

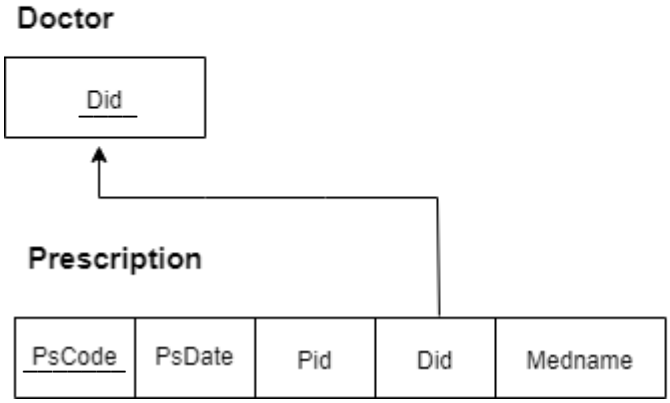
Appointment

Apcode	Apdate	Did	Pid	Rid

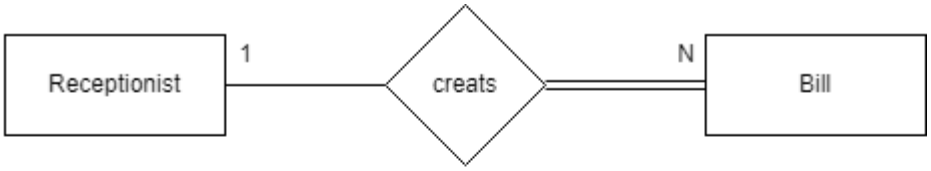
- Include the primary key of Did as a foreign key Eid in Appointment.

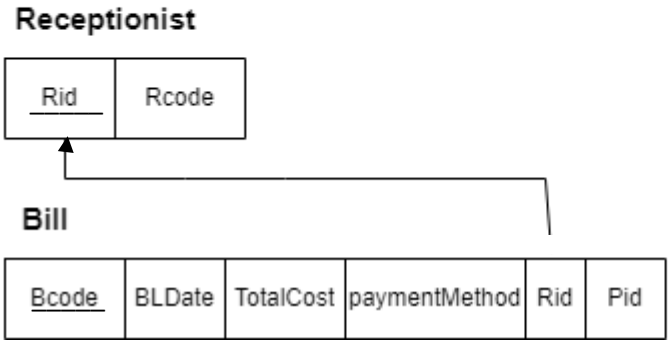


- Include the primary key of Did as a foreign key Did in Treatment.

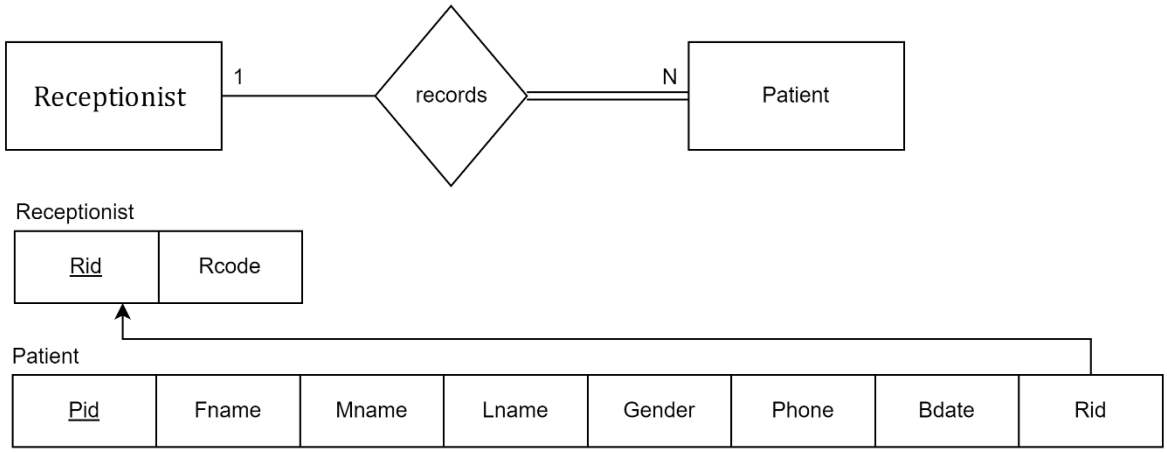


- Include the primary key of Did as a foreign key Did in Prescription.

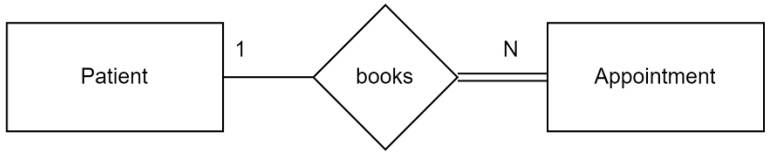


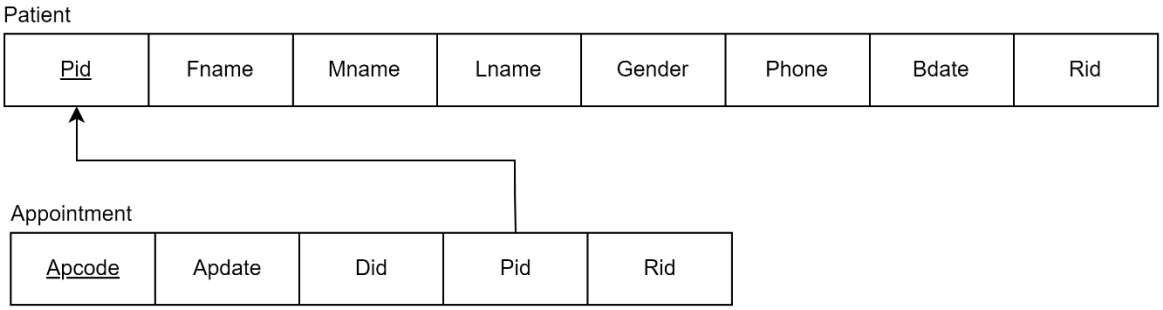


- Include the primary key of Rid as a foreign key Rid in Bill.

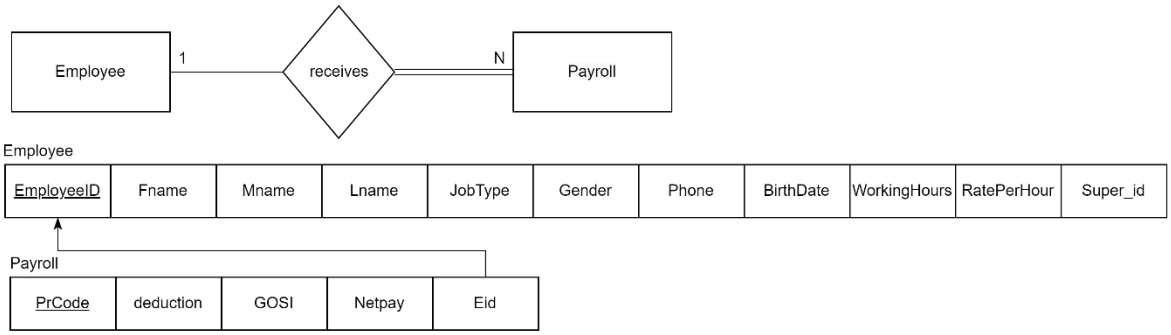


- Include the primary key of Rid as a foreign key Rid in Patient.

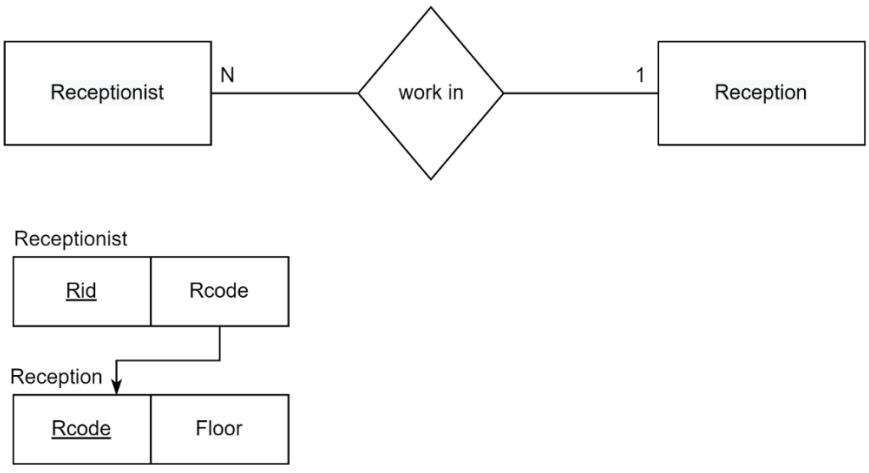




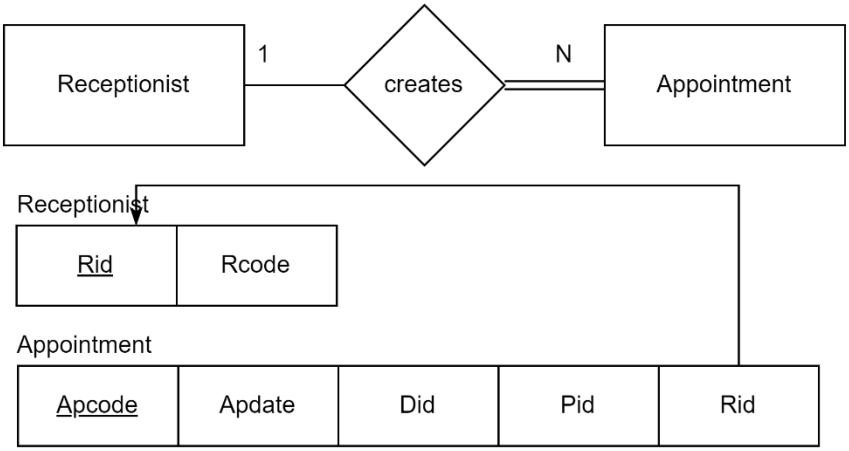
- Include the primary key of Pid as a foreign key Pid in Appointment.



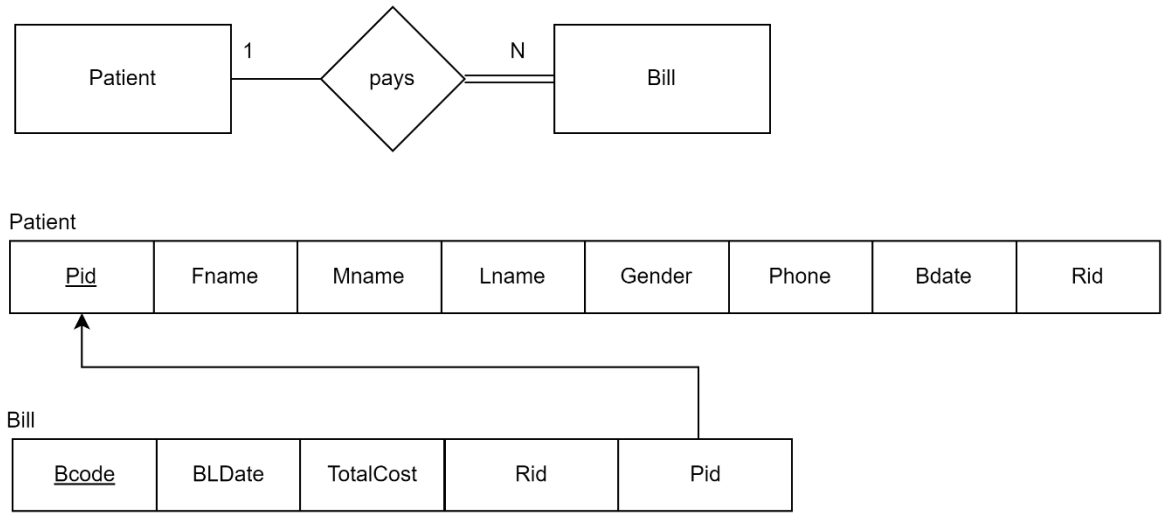
- Include the primary key of EemployeeID as a foreign key Eid in Payroll.



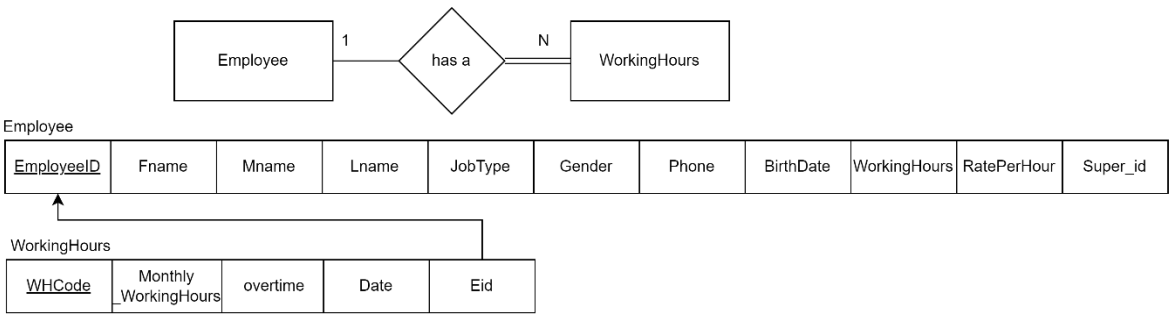
- Include the primary key of Rcode as a foreign key Rcode in Receptionist.



- Include the primary key of Rid as a foreign key Rid in Appointment.

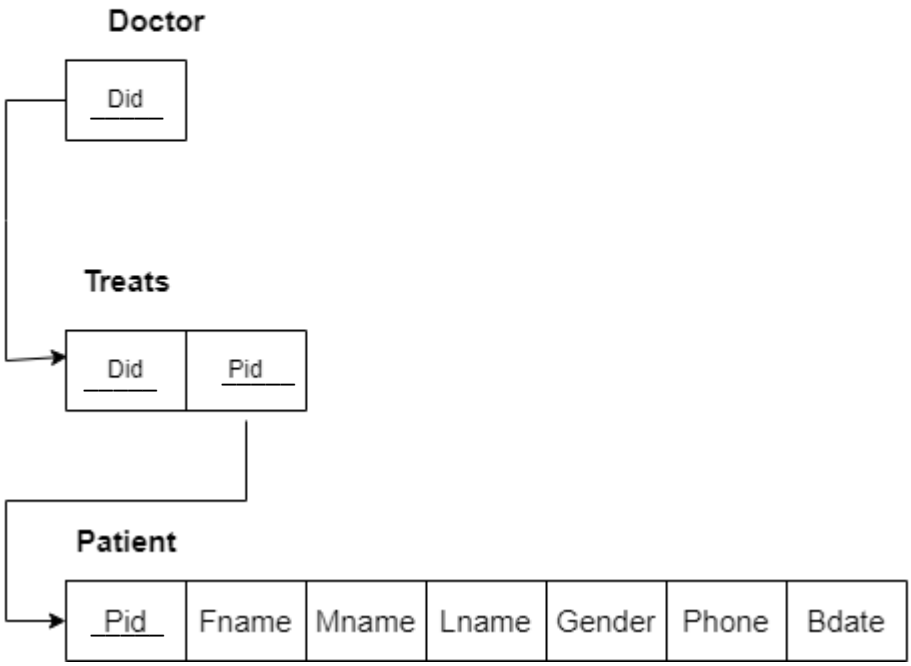


- Include the primary key of Pid as a foreign key Pid in Bill.

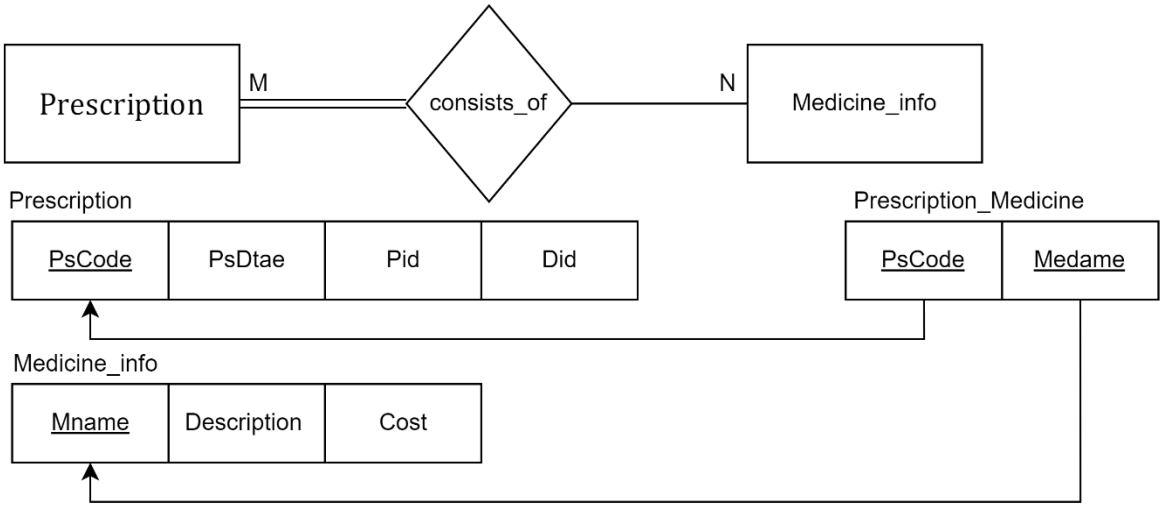


- Include the primary key of Eid as a foreign key Eid in WorkingHours.

3.5 Mapping of binary M-N relationship types

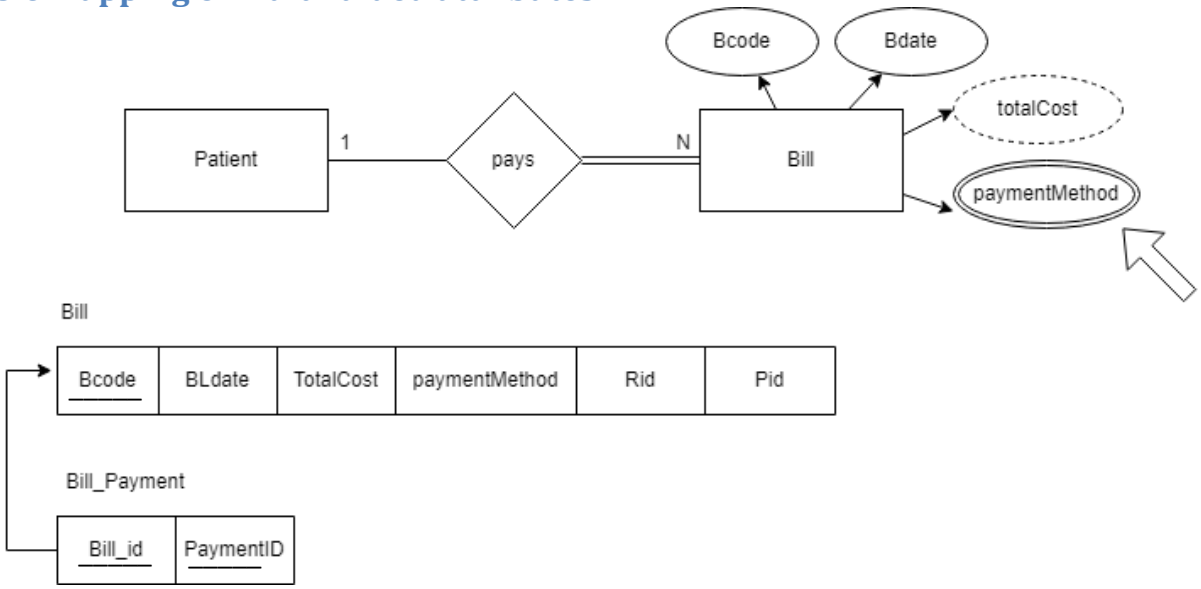


- new relation Treats that include the primary keys of Doctor and Patient.



- new relation Prescription_Medicine that include the primary keys of Prescription and Medicine_info.

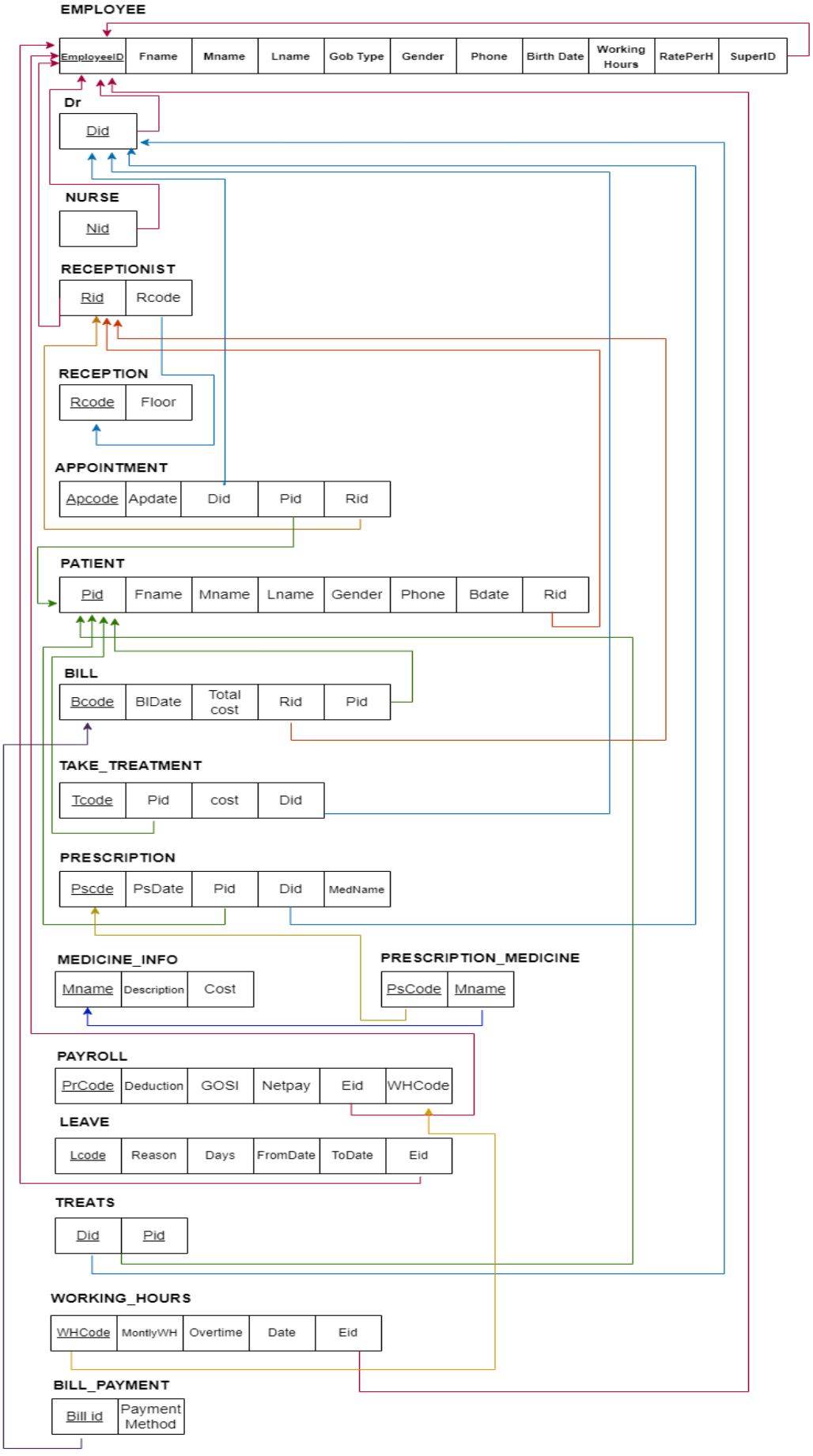
3.6 Mapping of multivalued attributes



3.7 Mapping of n-ary relationship types

None.

3.8 Schema Diagram



4 Normalization

4.1 First Normal Form

First Normal Form -1NF- does not allow composite and multivalued attributes, even nested relations. We already transformed the multivalued PaymentMethod attribute to a relation. So our relation satisfies 1NF.

4.2 Second Normal Form

Because we don't have any candidate key, or whole key, there no need to normalize our relational schema in 2NF.

4.3 Third Normal Form

The Third Normal Form [3NF] specifies a non-prime attribute in any relation that implicitly depends on the PK of the relation. As a result, all attributes in our schema are dependent solely on the key.

5 Final DB Schema Diagram

EMPLOYEE

EmployeeID	Fname	Mname	Lname	Gob Type	Gender	Phone	Birth Date	Working Hours	RatePerH	SuperID

Dr

Did

NURSE

Nid

RECEPTIONIST

Rid	Rcode

RECEPTION

Rcode	Floor

APPOINTMENT

Apcode	Apdate	Did	Pid	Rid

PATIENT

Pid	Fname	Mname	Lname	Gender	Phone	Bdate	Rid

BILL

Bcode	BIDate	Total cost	Rid	Pid

TAKE_TREATMENT

Tcode	Pid	cost	Did

PRESCRIPTION

Pscde	PsDate	Pid	Did

PRESCRIPTION_MEDICINE

PsCode	Medname

MEDICINE_INFO

Mname	Description	Cost

PAYROLL

PrCode	Deduction	GOSI	Netpay	Eid	WHCode

LEAVE

Lcode	Reason	Days	FromDate	ToDate	Eid

TREATS

Did	Pid

WORKING_HOURS

WHCode	MontlyWH	Overtime	Date	Eid

BILL_PAYMENT

Bill id	Payment Method

PART III: IMPLEMENTATION

6 Table Creation Script

6.1 *Employee* TABLE

```
CREATE TABLE Employee(
```

EmployeeID int PRIMARY KEY,

Fname varchar2(25) NOT NULL,

Mname varchar2(25),

Lname varchar2(25) NOT NULL,

JobType varchar2(30) NOT NULL,

Gender varchar2(10) NOT NULL,

Phone varchar2(50) NOT NULL,

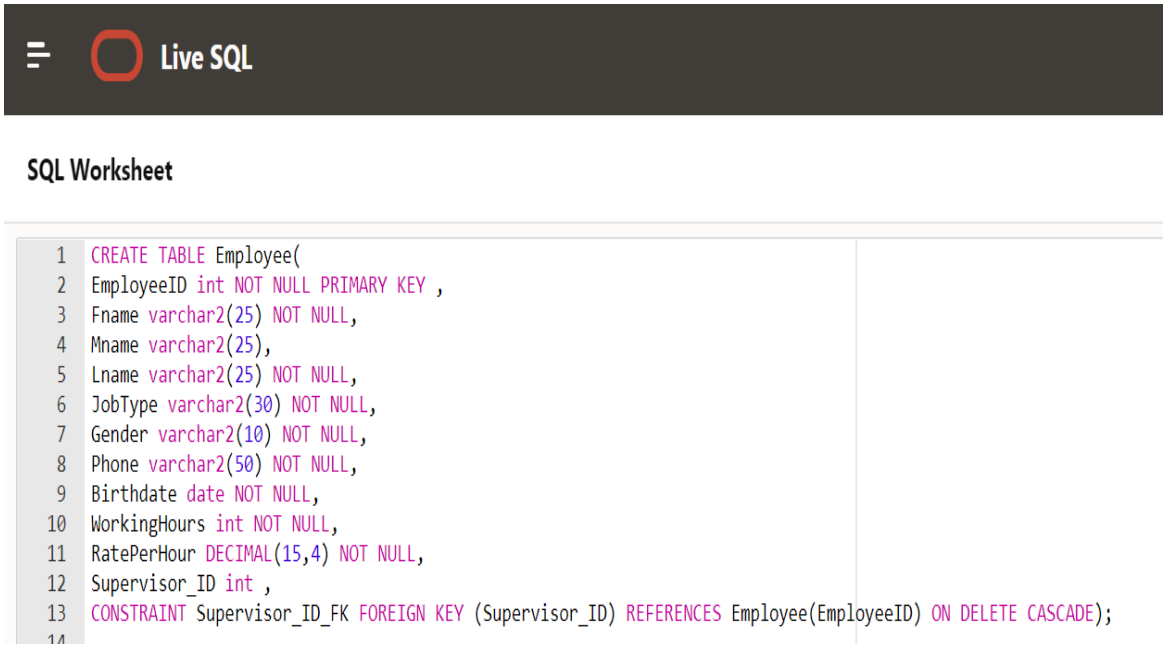
Birthdate date NOT NULL,

WorkingHours int NOT NULL,

RatePerHour DECIMAL(15,4) NOT NULL,

Supervisor_ID int NOT NULL,

CONSTRAINT Supervisor_ID_FK FOREIGN KEY (Supervisor_ID) REFERENCES Employee(EmployeeID) ON DELETE CASCADE);



6.2 Dr TABLE

CREATE TABLE Dr(

Did int PRIMARY KEY,

CONSTRAINT DID_FK FOREIGN KEY (Did) REFERENCES Employee(EmployeeID));

```
14
15  CREATE TABLE Dr(
16  Did int NOT NULL PRIMARY KEY,
17  CONSTRAINT DID_FK FOREIGN KEY (Did) REFERENCES Employee(EmployeeID));
18
```

6.3 Nurse TABLE

CREATE TABLE Nurse(

Nid int PRIMARY KEY,

CONSTRAINT NID_FK FOREIGN KEY (Nid) REFERENCES Employee(EmployeeID));

```
18
19  CREATE TABLE Nurse(
20  Nid int NOT NULL PRIMARY KEY,
21  CONSTRAINT NID_FK FOREIGN KEY (Nid) REFERENCES Employee(EmployeeID));
22
```

6.4 Reception TABLE

CREATE TABLE Reception(

Rcode varchar2(50)PRIMARY KEY ,

Floor int);

```
22
23  CREATE TABLE Reception(
24  Rcode varchar2(50) NOT NULL PRIMARY KEY ,
25  Floor int )
```

6.5 Receptionist TABLE

CREATE TABLE Receptionist(

RiD int PRIMARY KEY,

Rcode varchar2(50) NOT NULL,

CONSTRAINT Receptionist_ID_FK FOREIGN KEY(RiD) REFERENCES Employee(EmployeeID),

CONSTRAINT Rcode_ID_FK FOREIGN KEY(Rcode) REFERENCES Reception(Rcode) ON DELETE CASCADE);

```
27  CREATE TABLE Receptionist(
28  RiD int NOT NULL PRIMARY KEY,
29  Rcode varchar2(50) NOT NULL,
30  CONSTRAINT Receptionist_ID_FK FOREIGN KEY(RiD) REFERENCES Employee(EmployeeID),
31  CONSTRAINT Rcode_ID_FK FOREIGN KEY(Rcode) REFERENCES Reception(Rcode) ON DELETE CASCADE);
```

6.6 Patient TABLE

CREATE TABLE Patien(

PiD int PRIMARY KEY,

Fname varchar2(25) NOT NULL,

Mname varchar2(25) NOT NULL,

Lname varchar2(25) NOT NULL,

Gender varchar2(10) NOT NULL,

Phone varchar2(50) NOT NULL,

Bdate date NOT NULL,

Rid int NOT NULL,

CONSTRAINT R_id_FK FOREIGN KEY (Rid) REFERENCES Receptionist(Rid) ON DELETE CASCADE);

```
33  CREATE TABLE Patient(
34  PiD int NOT NULL PRIMARY KEY,
35  Fname varchar2(25) NOT NULL,
36  Mname varchar2(25) NOT NULL,
37  Lname varchar2(25) NOT NULL,
38  Gender varchar2(10) NOT NULL,
39  Phone varchar2(50) NOT NULL,
40  Bdate date NOT NULL,
41  Rid int NOT NULL,
42  CONSTRAINT R_id_FK FOREIGN KEY (Rid) REFERENCES Receptionist(Rid) ON DELETE CASCADE);
43
```

6.7 Appointment TABLE

CREATE TABLE Appointment(

Apcode int PRIMARY KEY,

Apdate date NOT NULL,

Did int NOT NULL,

Pid int NOT NULL,

Rid int NOT NULL,

CONSTRAINT D_id_FK FOREIGN KEY (Did) REFERENCES Dr(Did),

CONSTRAINT P_id_FK FOREIGN KEY (Pid) REFERENCES Patien(Pid),

CONSTRAINT Re_id_FK FOREIGN KEY (Rid) REFERENCES Receptionist(Rid));

```
43
44  CREATE TABLE Appointment(
45  Apcode int NOT NULL PRIMARY KEY,
46  Apdate date NOT NULL,
47  Did int NOT NULL,
48  Pid int NOT NULL,
49  Rid int NOT NULL,
50  CONSTRAINT D_id_FK FOREIGN KEY (Did) REFERENCES Dr(Did),
51  CONSTRAINT P_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid),
52  CONSTRAINT Re_id_FK FOREIGN KEY (Rid) REFERENCES Receptionist(Rid));
53
```

6.8 Bill TABLE

CREATE TABLE Bill(

Bcode int PRIMARY KEY,

BLdate date NOT NULL,

TotalCost DECIMAL(15,2) NOT NULL,

Pid int NOT NULL,

Rid int NOT NULL,

CONSTRAINT Rec_id_FK FOREIGN KEY (Rid) REFERENCES Receptionist(Rid),

CONSTRAINT Pa_id_FK FOREIGN KEY (Pid) REFERENCES Patien(Pid));

```
53
54  CREATE TABLE Bill(
55  Bcode int NOT NULL PRIMARY KEY,
56  BLdate date NOT NULL,
57  TotalCost DECIMAL(15,2) NOT NULL,
58  Pid int NOT NULL,
59  Rid int NOT NULL,
60  CONSTRAINT Rec_id_FK FOREIGN KEY (Rid) REFERENCES Receptionist(Rid),
61  CONSTRAINT Pa_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid));
62
```

6.9 Take_treatment TABLE

CREATE TABLE Take_treatment(

Tcode varchar2(50) NOT NULL PRIMARY KEY,

cost DECIMAL(15,2) NOT NULL,

Did int NOT NULL,

Pid int NOT NULL,

CONSTRAINT Pt_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid),

CONSTRAINT DR_id_FK FOREIGN KEY (Did) REFERENCES Dr(Did));

```
62
63  CREATE TABLE Take_treatment(
64  Tcode varchar2(50) NOT NULL PRIMARY KEY,
65  cost DECIMAL(15,2) NOT NULL,
66  Did int NOT NULL,
67  Pid int NOT NULL,
68  CONSTRAINT Pt_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid),
69  CONSTRAINT DR_id_FK FOREIGN KEY (Did) REFERENCES Dr(Did));
```

6.10 Prescription TABLE

CREATE TABLE Prescription(

PsCode varchar2(50) NOT NULL PRIMARY KEY,

PsDate Date,

Pid int NOT NULL,

Did int NOT NULL,

Medname varchar2(25),

CONSTRAINT Pat_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid),

CONSTRAINT Doc_Id_FK FOREIGN KEY (Did) REFERENCES Dr(Did));

```
CREATE TABLE Prescription(
PsCode varchar2(50) NOT NULL PRIMARY KEY,
PsDate Date,
Pid int NOT NULL,
Did int NOT NULL,
Medname varchar2(25),
CONSTRAINT Pat_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid),
CONSTRAINT Doc_Id_FK FOREIGN KEY (Did) REFERENCES Dr(Did));
```

6.11 Medicine_info TABLE

CREATE TABLE Medicine_info(

Mname varchar2(25) NoT NULL PRIMARY KEY,

Description varchar2(255) NOT NULL,

Cost DECIMAL(15,4));

```
CREATE TABLE Medicine_info(
Mname varchar2(25) NoT NULL PRIMARY KEY,
Description varchar2(255) NOT NULL,
Cost DECIMAL(15,4));
```

6.12 Prescription_medicine TABLE

CREATE TABLE Prescription_medicine(

PsCode varchar2(50)NoT NULL PRIMARY KEY,

Mname varchar2(25) NoT NULL,

CONSTRAINT PsCode_FK FOREIGN KEY (PsCode) REFERENCES Prescription(PsCode),

CONSTRAINT Mname_FK FOREIGN KEY (Mname) REFERENCES Medicine_info(Mname) ON DELETE CASCADE);

```
CREATE TABLE Prescription_medicine(
PsCode varchar2(50)NoT NULL PRIMARY KEY,
Mname varchar2(25) NoT NULL,
CONSTRAINT PsCode_FK FOREIGN KEY (PsCode) REFERENCES Prescription(PsCode),
CONSTRAINT Mname_FK FOREIGN KEY (Mname) REFERENCES Medicine_info(Mname) ON DELETE CASCADE);
```

6.13 Payroll TABLE

CREATE TABLE Payroll(

PrCode varchar2(50) NOT NULL PRIMARY KEY,

Dedection DECIMAL(15,4),

GOSI DECIMAL(15,4),

Netpay DECIMAL(15,4),

Eid int NOT NULL,

CONSTRAINT Emp_ID_FK FOREIGN KEY (Eid) REFERENCES Employee(EmployeeID));

```
91  CREATE TABLE Payroll(
92  PrCode varchar2(50) NOT NULL PRIMARY KEY,
93  Dedection DECIMAL(15,4),
94  GOSI DECIMAL(15,4),
95  Netpay DECIMAL(15,4),
96  Eid int NOT NULL,
97  CONSTRAINT Emp_ID_FK FOREIGN KEY (Eid) REFERENCES Employee(EmployeeID));
```

6.14 Leave TABLE

CREATE TABLE Leave(

Lcode int NoT NULL PRIMARY KEY,

Reason varchar2(255),

Days int,

FromDate Date,

ToDate Date,

Eid int not null ,

CONSTRAINT Empl_ID_FK FOREIGN KEY (Eid) REFERENCES Employee(EmployeeID));

```
99  CREATE TABLE Leave(
100 Lcode int NoT NULL PRIMARY KEY,
101 Reason varchar2(255),
102 Days int,
103 FromDate Date,
104 ToDate Date,
105 Eid int not null ,
106 CONSTRAINT Empl_ID_FK FOREIGN KEY (Eid) REFERENCES Employee(EmployeeID));
```

6.15 Treats TABLE

CREATE TABLE Treats(

Did int NOT NULL,

Pid int NOT NULL,

PRIMARY KEY(Did, Pid),

CONSTRAINT Doct_ID_FK FOREIGN KEY (Did) REFERENCES Dr(Did),

CONSTRAINT Pati_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid));

```
108 CREATE TABLE Treats(
109 Did int NOT NULL,
110 Pid int NOT NULL,
111 PRIMARY KEY( Did, Pid),
112 CONSTRAINT Doct_ID_FK FOREIGN KEY (Did) REFERENCES Dr(Did),
113 CONSTRAINT Pati_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid));
```

6.16 Working_hours TABLE

CREATE TABLE Working_hours(

WHCode int NOT NULL PRIMARY KEY,

MonthlyWH NUMERIC(10),

Overtime NUMERIC(10),

w_Date Date,

Eid int NOT NULL,

CONSTRAINT Emplo_ID_FK FOREIGN KEY (Eid) REFERENCES Employee(EmployeeID));

```
114
115  CREATE TABLE Working_hours(
116  WHCode int NOT NULL PRIMARY KEY,
117  MonthlyWH NUMERIC(10),
118  Overtime NUMERIC(10),
119  w_Date Date,
120  Eid int NOT NULL,
121  CONSTRAINT Emplo_ID_FK FOREIGN KEY (Eid) REFERENCES Employee(EmployeeID));
122
```

6.17 Bill_payment TABLE

CREATE TABLE Bill_payment(

Bill_id int not null,

PaymentMethod varchar(10),

PRIMARY KEY(Bill_id, PaymentMethod),

CONSTRAINT Bill_id_FK FOREIGN KEY (Bill_id) REFERENCES Bill(Bcode) ON DELETE CASCADE);

```
123  CREATE TABLE Bill_payment(
124  Bill_id int not null,
125  PaymentMethod varchar(10),
126  PRIMARY KEY( Bill_id, PaymentMethod),
127  CONSTRAINT Bill_id_FK FOREIGN KEY (Bill_id) REFERENCES Bill(Bcode) ON DELETE CASCADE);
```

My Session

Actions | Reset

Sort

most recent last

View

Statements and Results

Statement 1

```
CREATE TABLE Employee(
EmployeeID int NOT NULL PRIMARY KEY ,
Fname varchar2(25) NOT NULL,
Mname varchar2(25),
Lname varchar2(25) NOT NULL,
JobType varchar2(30) NOT NULL,
Gender varchar2(10) NOT NULL,
Phone varchar2(50) NOT NULL,
Birthdate date NOT NULL,
WorkingHours int NOT NULL,
RatePerHour DECIMAL(15,4) NOT NULL,
Supervisor_ID int ,
CONSTRAINT Supervisor_ID_FK FOREIGN KEY (Supervisor_ID) REFE
```

```
Table created.
```

Statement 2

```
CREATE TABLE Dr(
Did int NOT NULL PRIMARY KEY,
CONSTRAINT DID_FK FOREIGN KEY (Did) REFERENCES Employee(Empl
```

```
Table created.
```

Statement 3

```
CREATE TABLE Nurse(
Nid int NOT NULL PRIMARY KEY,
CONSTRAINT NID_FK FOREIGN KEY (Nid) REFERENCES Employee(Empl
```

```
Table created.
```

Statement 4

```
CREATE TABLE Reception(
Rcode varchar2(50) NOT NULL PRIMARY KEY ,
Floor int )
```

```
Table created.
```

Statement 5

```
CREATE TABLE Receptionist(
RiD int NOT NULL PRIMARY KEY,
Rcode varchar2(50) NOT NULL,
CONSTRAINT Receptionist_ID_FK FOREIGN KEY(RiD) REFERENCES Em
CONSTRAINT Rcode_ID_FK FOREIGN KEY(Rcode) REFERENCES Recepti
```

```
Table created.
```

Statement 6

```
CREATE TABLE Patient(
PiD int NOT NULL PRIMARY KEY,
Fname varchar2(25) NOT NULL,
Mname varchar2(25) NOT NULL,
Lname varchar2(25) NOT NULL,
Gender varchar2(10) NOT NULL,
Phone varchar2(50) NOT NULL,
Bdate date NOT NULL,
Rid int NOT NULL,
CONSTRAINT R_id_FK FOREIGN KEY (Rid) REFERENCES Receptionist
```

```
Table created.
```

Statement 7

```
CREATE TABLE Appointment(
Apcode int NOT NULL PRIMARY KEY,
Apdate date NOT NULL,
Did int NOT NULL,
Pid int NOT NULL,
Rid int NOT NULL,
CONSTRAINT D_id_FK FOREIGN KEY (Did) REFERENCES Dr(Did),
CONSTRAINT P_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid)
CONSTRAINT Re_id_FK FOREIGN KEY (Rid) REFERENCES Receptionis
```

```
Table created.
```

Statement 8

```
CREATE TABLE Bill(
Bcode int NOT NULL PRIMARY KEY,
BLdate date NOT NULL,
TotalCost DECIMAL(15,2) NOT NULL,
Pid int NOT NULL,
Rid int NOT NULL,
CONSTRAINT Rec_id_FK FOREIGN KEY (Rid) REFERENCES Receptionist(Rid),
CONSTRAINT Pa_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid))
```

```
Table created.
```

Statement 9

```
CREATE TABLE Take_treatment(
Tcode varchar2(50) NOT NULL PRIMARY KEY,
cost DECIMAL(15,2) NOT NULL,
Did int NOT NULL,
Pid int NOT NULL,
CONSTRAINT Pt_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pic
CONSTRAINT DR_id_FK FOREIGN KEY (Did) REFERENCES Dr(Did))
```

```
Table created.
```

Statement 10

```
CREATE TABLE Prescription(
PsCode varchar2(50) NOT NULL PRIMARY KEY,
PsDate Date,
Pid int NOT NULL,
Did int NOT NULL,
Medname varchar2(25),
CONSTRAINT Pat_id_FK FOREIGN KEY (Pid) REFERENCES Patient(P:
CONSTRAINT Doc_Id_FK FOREIGN KEY (Did) REFERENCES Dr(Did))
```

```
Table created.
```

Statement 11

```
CREATE TABLE Medicine_info(
Mname varchar2(25) NoT NULL PRIMARY KEY,
Description varchar2(255) NOT NULL,
Cost DECIMAL(15,4))
```

```
Table created.
```

Statement 12

```
CREATE TABLE Prescription_medicine(
PsCode varchar2(50)NoT NULL PRIMARY KEY,
Mname varchar2(25) NoT NULL,
CONSTRAINT PsCode_FK FOREIGN KEY (PsCode) REFERENCES Prescr:
CONSTRAINT Mname_FK FOREIGN KEY (Mname) REFERENCES Medicine_
```

```
Table created.
```

Statement 13

```
CREATE TABLE Payroll(
PrCode varchar2(50) NOT NULL PRIMARY KEY,
Dedection DECIMAL(15,4),
GOSI DECIMAL(15,4),
Netpay DECIMAL(15,4),
Eid int NOT NULL,
CONSTRAINT Emp_ID_FK FOREIGN KEY (Eid) REFERENCES Employee(EmployeeID))
```

```
Table created.
```

Statement 14

```
CREATE TABLE Leave(
Lcode int NOT NULL PRIMARY KEY,
Reason varchar2(255),
Days int,
FromDate Date,
ToDate Date,
Eid int not null ,
CONSTRAINT Empl_ID_FK FOREIGN KEY (Eid) REFERENCES Employee
```

```
Table created.
```

Statement 15

```
CREATE TABLE Treats(
Did int NOT NULL,
Pid int NOT NULL,
PRIMARY KEY( Did, Pid),
CONSTRAINT Doct_ID_FK FOREIGN KEY (Did) REFERENCES Dr(Did),
CONSTRAINT Pati_id_FK FOREIGN KEY (Pid) REFERENCES Patient(
```

```
Table created.
```

Statement 16

```
CREATE TABLE Working_hours(
WHCode int NOT NULL PRIMARY KEY,
MonthlyWH NUMERIC(10),
Overtime NUMERIC(10),
W_Date Date,
Eid int NOT NULL,
CONSTRAINT Emplo_ID_FK FOREIGN KEY (Eid) REFERENCES Employe
```

```
Table created.
```

Statement 17

```
CREATE TABLE Bill_payment(
Bill_id int not null,
PaymentMethod varchar(10),
PRIMARY KEY( Bill_id, PaymentMethod),
CONSTRAINT Bill_id_FK FOREIGN KEY (Bill_id) REFERENCES Bill(Bcode) ON DELETE CASCADE)
```

```
Table created.
```

7 Constraints Script

Eamples of constraints that have been imposed on our projects are provided in this section, the table below does not explain all the constraints on our database, but it does explain some of the basics and important ones

Business Rule	SQL Script	Table
Each employee must have a unique id	Eid int NOT NULL PRIMARY KEY	EMPLOYEE
A doctor cannot treat a patient without making an appointment.	CREATE TABLE Appointment(Apcode int NOT NULL PRIMARY KEY, Did int NOT NULL, Pid int NOT NULL, CONSTRAINT D_id_FK FOREIGN KEY (Did) REFERENCES Dr(Did), CONSTRAINT P_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid));	APPOINTMENT
Each bill must calculate the total cost for each patient.	CREATE TABLE Bill(Bcode int NOT NULL PRIMARY KEY, TotalCost DECIMAL(15,2) NOT NULL, Pid int NOT NULL, CONSTRAINT Pa_id_FK FOREIGN KEY (Pid) REFERENCES Patient(Pid));	BILL
Each employee will have his own payroll in which the the netpay and deductions will be calculated	CREATE TABLE Payroll(Dedection DECIMAL(15,4), Netpay DECIMAL(15,4), Eid int NOT NULL, CONSTRAINT Emp_ID_FK FOREIGN KEY (Eid) REFERENCES Employee(EmployeeID));	PAYROLL
Each Patient will take a treatment from a doctor	CREATE TABLE Take_treatment(Did int NOT NULL, Pid int NOT NULL, CONSTRAINT Pt_id_FK FOREIGN KEY (Pid)	TAKE_TREATMENT

	REFERENCES Patient(Pid), CONSTRAINT DR_id_FK FOREIGN KEY (Did) REFERENCES Dr(Did));	

8 Queries and Transactions

In the following subsections, write down five different SQL queries which implements five of the intended output of your system (q.v. Section 1.4). They should be the most important queries. Also, show examples of one update and one delete.

8.1 *<Specific bills>*

Query in Natural Language (English)

Search for bills that have cost more than the specified cost

SQL Script

```
SELECT B.Pid, P.Fname, P.Mname, P.Lname, B.TotalCost

FROM  Bill B, Patient P, Prescription C

WHERE  B.Pid = p.PiD AND C.Pid = p.PiD AND TotalCost > ALL (SELECT TotalCost

FROM Bill

WHERE TotalCost = 350.10);
```

Caption of the First Five Rows of the Output

PID	FNAME	MNAME	LNAME	TOTALCOST	MEDNAME
7777	khaled	hamad	almalki	1200.2	Tooth wheitining
7772	Amal	Yaser	Ramadan	1500.35	Dental crown
7757	Huda	Omar	Bakhsh	1500.35	Dental crown

Download CSV

3 rows selected.

8.2 *< Insert a new Employee >*

Query in Natural Language (English)

-Insert a new Employee into the system with a job title [doctors, nurses, receptionists]

SQL Script

```
INSERT INTO employee (EmployeeID , Fname, Mname ,Lname , JobType ,Gender ,Phone ,Birthdate
,WorkingHours,RatePerHour ,supervisor_ID )

VALUES (1423, 'Noor', 'ahmad', 'Alsaidi', 'Nurse', 'Female', 0590453218, to_date('1-5-1990','dd-mm-
yyyy'), 8, 150.987, Null);


select *

from employee;
```

Caption of the First Five Rows of the Output

2322	Khadeeja	Ahmed	Alebrahim	Nurse	female	543114049	20-JUL-98	12	20.123	2222
3333	Fayzah	Salman	Alghamdi	Receptionist	female	543111049	15-FEB-99	14	20.123	-
3334	Salma	Khaled	Alturki	Receptionist	female	553111049	15-FEB-99	14	20.123	3333
3343	Majed	Abdullah	Halawani	Receptionist	male	553111049	01-FEB-99	14	20.123	3333
3433	Waleed	Mohammed	Alkhaldi	Receptionist	male	553011049	17-SEP-97	14	20.123	3333
1423	Noor	ahmad	Alsaidi	Nurse	Female	590453218	01-MAY-90	8	150.987	-

Download CSV

15 rows selected.

8.3 *<Display details patient>*

Query in Natural Language (English)

Print the patient ID, patient Fname, patient Mname , patient Lname, and the totalcost of Bill with as Total_Cost in each patient

SQL Script

```
select p.pid,p.fname,p.mname,p.Lname,b.totalcost Total_Cost

from patient p , Bill  b

where p.pid=b.pid

order by p.pid;
```

Caption of the First Five Rows of the Output

PID	FNAME	MNAME	LNAME	TOTAL_COST
7177	Wejdan	Fayes	alqarni	250.35
7707	Maher	Abdullah	almalki	250.15
7717	Saud	Abdulrahman	Mahfoz	250.35
7727	Sumayya	Khaled	Alnahdi	350.1
7757	Huda	Omar	Bakhsh	1500.35
7772	Amal	Yaser	Ramadan	1500.35
7773	Hala	Muhammed	alOtaibi	70
7774	Abrar	Saad	Alghamdi	70
7777	khled	hamad	almalki	1200.2

Download CSV

9 rows selected.

8.4 *<total doctor's patients >*

Query in Natural Language (English)

"Number of patients who have taken at least one appointment at each doctor "

SQL Script

```
SELECT did, count( pid)

FROM appointment

group by did;
```

Caption of the First Five Rows of the Output

DID	COUNT(PID)
1112	2
1111	2
1211	2
1121	2
1311	1

Download CSV

5 rows selected.

8.5 *<certain appointment's patients>*

Query in Natural Language (English)

Data of all patient that booked appointment on '01-11-2021'

SQL Script

```
SELECT pt.pid  "id of the patient",
    drr.did AS "id of the dr ",
    ap.Apdate
FROM patient pt
JOIN appointment ap ON ap.pid=pt.pid
JOIN dr drr ON ap.did=drr.did
WHERE ap.Apdate =to_date('01-11-2021','dd-mm-yyyy');
```

Caption of the First Five Rows of the Output

id of the patient	id of the dr	APDATE
7757	1211	01-NOV-21
7772	1112	01-NOV-21

Download CSV

2 rows selected.

8.6 Update Example

Update in Natural Language (English)

Will update the totalcost value of the record with a pid of 7773. The value it will set it to is the MAX of the totalcost value for all records in the bill table.

SQL Script

```
UPDATE Bill
SET totalcost = (
SELECT MAX(totalcost)
FROM bill)
WHERE pid=7773 ;
```

Caption of the Output

1 row(s) updated.

BCODE	BLDATE	TOTALCOST	PID	RID
1	23-OCT-20	250.35	7717	3433
10	05-JUL-20	70	7774	3433
11	01-NOV-21	1500.35	7772	3334
100	01-DEC-21	350.1	7727	3334
101	12-NOV-21	250.15	7707	3343
110	09-SEP-21	250.35	7177	3343
111	01-NOV-21	1500.35	7757	3333
1000	01-NOV-22	1200.2	7777	3333
1001	16-AUG-21	1500.35	7773	3333

Download CSV

9 rows selected.

8.7 Delete Example

Delete in Natural Language (English)

Delete all the prescriptions that contains a 'Voltaren' medicine

SQL Script

Delete from Prescription_medicine

Where Mname = 'Voltaren';

Caption of the Output

PSCODE	MNAME
3356	Tooth wheitining
3256	Dental crown
3556	Tooth cleaning
3566	Tooth filling procedure
3546	Nitrous Oxide
3446	Dental crown
3116	Tooth cleaning

Download CSV

7 rows selected.

APPENDIX

EMPLOYEE

EMPLOYEEID	FNAME	MNAME	LNAME	JOBTYPE	GENDER	PHONE	BIRTHDATE	WORKINGHOURS	RATEPERHOUR	SUPERVISOR_ID
1111	Muhammed	Khaled	Alharbi	Dr	male	567392049	11-FEB-85	12	13.123	-
1211	Yusra	Mohammed	almalki	Dr	female	511392049	12-JUL-95	13	13.133	1111
1121	Ahmed	Abdullah	Alzahrani	Dr	male	563492049	10-FEB-78	11	20.123	1111
1112	Fuaad	Mohammed	Bakhsh	Dr	male	567792049	11-FEB-88	11	20.123	1111
1311	Fatima	Ahmed	Alqarni	Dr	female	562222049	10-JUN-78	17	20.123	1111
2222	Suaad	Hameed	alsufyani	Nurse	female	543492049	10-FEB-78	11	20.123	-
2122	Bushra	Salem	Alshehri	Nurse	female	543112049	15-FEB-98	14	20.123	2222
2212	Mario	Jack	Goll	Nurse	male	543117049	15-FEB-98	14	20.123	2222
2221	Johny	depp	Scott	Nurse	male	543112099	15-FEB-87	14	18.123	2222
2322	Khadeeja	Ahmed	Alebrahim	Nurse	female	543114049	20-JUL-98	12	20.123	2222
2232	Qamar	Ahmed	Alebrahim	Nurse	female	542114049	20-JUL-98	12	20.123	2222
3333	Fayzah	Salman	Alghamdi	Receptionist	female	543111049	15-FEB-99	14	20.123	-
3334	Salma	Khaled	Alturki	Receptionist	female	553111049	15-FEB-99	14	20.123	3333
3343	Majed	Abdullah	Halawani	Receptionist	male	553111049	01-FEB-99	14	20.123	3333
3433	Waleed	Mohammed	Alkhaldi	Receptionist	male	553011049	17-SEP-97	14	20.123	3333

Dr

DID
1111
1112
1121
1211
1311

APPOINTMENT

APCODE	APDATE	DID	PID	RID
4444	16-AUG-21	1111	7773	3333
4441	01-NOV-22	1111	7777	3333
4442	01-NOV-21	1211	7757	3333
4443	09-SEP-21	1211	7177	3343
4445	12-NOV-21	1121	7707	3343
4446	01-DEC-21	1121	7727	3334
4447	01-NOV-21	1112	7772	3334
4448	05-JUL-20	1311	7774	3433
4449	23-OCT-20	1112	7717	3433

Bill

BCODE	BLDATE	TOTALCOST	PID	RID
1	23-OCT-20	250.35	7717	3433
10	05-JUL-20	70	7774	3433
11	01-NOV-21	1500.35	7772	3334
100	01-DEC-21	350.1	7727	3334
101	12-NOV-21	250.15	7707	3343
110	09-SEP-21	250.35	7177	3343
111	01-NOV-21	1500.35	7757	3333
1000	01-NOV-22	1200.2	7777	3333
1001	16-AUG-21	70	7773	3333

MEDICINE_INFO

MNAME	DESCRIPTION	COST
Voltaren	Strong toothache reliever	70
Tooth wheitining	Teeth whitening with laser beams	1200.2
Dental crown	Dental covering after filling	1500.35
Tooth cleaning	Removing tarter from teeth	250.35
Tooth filling procedure	Tooth decay treatment with filling	250.15
Nitrous Oxide	Using Nitrous Oxide to anesthetize children	350.1

NURSE

NID
2122
2212
2221
2222
2232
2322

LEAVE table

LCODE	REASON	DAYS	FROMDATE	TODATE	EID
123	Sick leave	7	20-OCT-20	28-OCT-20	1111
133	Vacation	2	01-JAN-20	03-JAN-20	2212
132	Annual leave	10	17-NOV-21	27-NOV-21	1112
103	Parental leave	60	30-OCT-21	30-DEC-21	1311

RECEPTION table

RCODE	FLOOR
1134	1
1244	2
1234	3
1224	4

PATIENT

PID	FNAME	MNAME	LNAME	GENDER	PHONE	BDATE	RID
7777	khled	hamad	almalki	male	565666775	12-NOV-88	3333
7757	Huda	Omar	Bakhsh	female	565646775	08-NOV-04	3333
7177	Wejdan	Fayes	alqarni	female	565066775	07-JUL-07	3334
7773	Hala	Muhammed	alOtaibi	female	555666775	12-NOV-05	3334
7717	Saud	Abdulrahman	Mahfoz	male	544116775	11-DEC-77	3343
7707	Maher	Abdullah	almalki	male	565661775	12-NOV-88	3343
7727	Sumayya	Khaled	Alnahdi	female	555666745	02-APR-11	3433
7772	Amal	Yaser	Ramadan	female	575666775	10-AUG-98	3433
7774	Abrar	Saad	Alghamdi	female	565333775	01-JAN-01	3333

RECEPTIONIST

RID	RCODE
3333	1134
3334	1244
3343	1234
3433	1224

PRESCREPTION_MEDICINE

PSCODE	MNAME
3456	Voltaren
3356	Tooth wheitining
3256	Dental crown
3556	Tooth cleaning
3566	Tooth filling procedure
3546	Nitrous Oxide
3446	Dental crown
3416	Voltaren
3116	Tooth cleaning

TAKE_TREATMENT

TCODE	COST	DID	PID
a350	970.4	1111	7773
a351	650.2	1111	7777
a352	250.35	1211	7757
a353	300.35	1211	7177
a354	740.15	1121	7707
a355	1000.1	1121	7727
a356	250.35	1112	7772
a357	500	1311	7774
a358	250.35	1112	7717

TREATS

DID	PID
1111	7773
1111	7777
1112	7717
1112	7772
1121	7707
1121	7727
1211	7177
1211	7757
1311	7774

BILL_BAYMENT

BILL_ID	PAYMENTMETHOD
1	visa
10	cash
10	insurance
11	insurance
100	visa
101	cash
110	cash
111	visa
1000	cash
1000	insurance
1001	visa

WORKING_HOURS

WHCODE	MONTHLYWH	OVERTIME	W_DATE	EID
0	6	0	16-APR-22	1111
1	13	2	16-APR-22	1211
2	11	3	16-APR-22	1121
3	5	0	16-APR-22	1112
4	17	5	16-APR-22	1311
5	11	4	16-APR-22	2222
6	10	4	16-APR-22	2122
7	14	2	16-APR-22	2212
8	14	5	16-APR-22	2221
9	12	2	16-APR-22	2322
11	14	4	16-APR-22	3333
12	12	2	16-APR-22	3334
13	14	3	16-APR-22	3343
14	13	2	16-APR-22	3433

PAYROLL

PRCODE	EID
0	1111
1	1211
2	1121
3	1112
4	1311
5	2222
6	2122
7	2212
8	2221
9	2322
11	3333
12	3334
13	3343
14	3433

DEDUCTION

DEDUCTION	PRCODE
78.738	0
0	1
0	2
120.738	3
0	4
0	5
80.492	6
0	7
0	8
0	9
0	11
40.246	12
0	13
20.123	14

COMP_SALARY

MONTHLY	PRCODE
157.476	0
170.729	1
221.353	2
221.353	3
342.091	4
221.353	5
281.722	6
281.722	7
253.722	8
241.476	9
281.722	11
281.722	12
281.722	13
281.722	14

GOSI

GOSI	PRCODE
3.9369	0
8.53645	1
11.06765	2
5.03075	3
17.10455	4
11.06765	5
10.0615	6
14.0861	7
12.6861	8
12.0738	9
14.0861	11
12.0738	12
14.0861	13
13.07995	14

FINAL_PAYROLL

PRCODE	DEDUCTION	GOSI	NETPAY
0	78.738	3.9369	74.8011
1	0	8.53645	162.19255
2	0	11.06765	210.28535
3	120.738	5.03075	95.58425
4	0	17.10455	324.98645
5	0	11.06765	210.28535
6	80.492	10.0615	191.1685
7	0	14.0861	267.6359
8	0	12.6861	241.0359
9	0	12.0738	229.4022
11	0	14.0861	267.6359
12	40.246	12.0738	229.4022
13	0	14.0861	267.6359
14	20.123	13.07995	248.51905

NETPAY

NETPAY	PRCODE
74.8011	0
162.19255	1
210.28535	2
95.58425	3
324.98645	4
210.28535	5
191.1685	6
267.6359	7
241.0359	8
229.4022	9
267.6359	11
229.4022	12
267.6359	13
248.51905	14