

# **DATABASE DESIGN PROJECT**

## **SUNSHINE HOSPITAL MANAGEMENT SYSTEM**

**Submitted to Professor**

Asem Omari

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# Requirement Analysis:

## 1) Company Overview and Product:

**Company Name:** Sunshine Hospital

**Company Product:** Sunshine Hospital Management Systems

**Type of Company:** Health Care

### **Description of Company:**

Sunshine Hospital is a famous multi-specialist hospital based in Canada. It has many sub-branches across the country. The main branch of the Hospital is located at 334, Moore park avenue, North York, Ontario, Canada - M2R 2R6. It provides 24\*7 emergency services. It has high tech latest medical equipment and highly qualified doctors.

Patients need to book an appointment before visiting a doctor unless its an emergency. They can do it by visiting any branch with the help of a receptionist, or they can book an appointment online using a website or an app. Once the appointment is booked, the Patient can see the Doctor during the allocated time. If there is an emergency, then a patient can directly go to the Doctor in the emergency ward, and formalities can be completed later. A receptionist could allocate the Room and a nurse in a hospital if doctors asked for it. Before leaving the Hospital, a patient must pay the bills for Medicine and treatment. All the medical history of the Patient is stored and kept in a secure location following HIPAA compliance. Hospital also has a trainee program where fresh graduate doctors are provided with internship and a real experience of operations.

## 2) Patient Billing Invoice:

<Name of Hospital>

LOGO

<Business Address>

<Business Contact No.>

<Web Site/URL>

<Business Slogan, if any>

## INVOICE

Patient Name  
Address  
Contact No.  
Gender  
Age

Date :  
Number :  
Due Date :

SR#	DESCRIPTION	MU	QTY	PRICE	AMOUNT
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
					-
Terms and Conditions:				Sub-total	-
				Tax Rate	
				Tax	-
				Discount/s	-
				Insurance Claim	-
				Total Amount Due	-

<State total amount due in words>

Signature

<Prepared by>

<Designation>

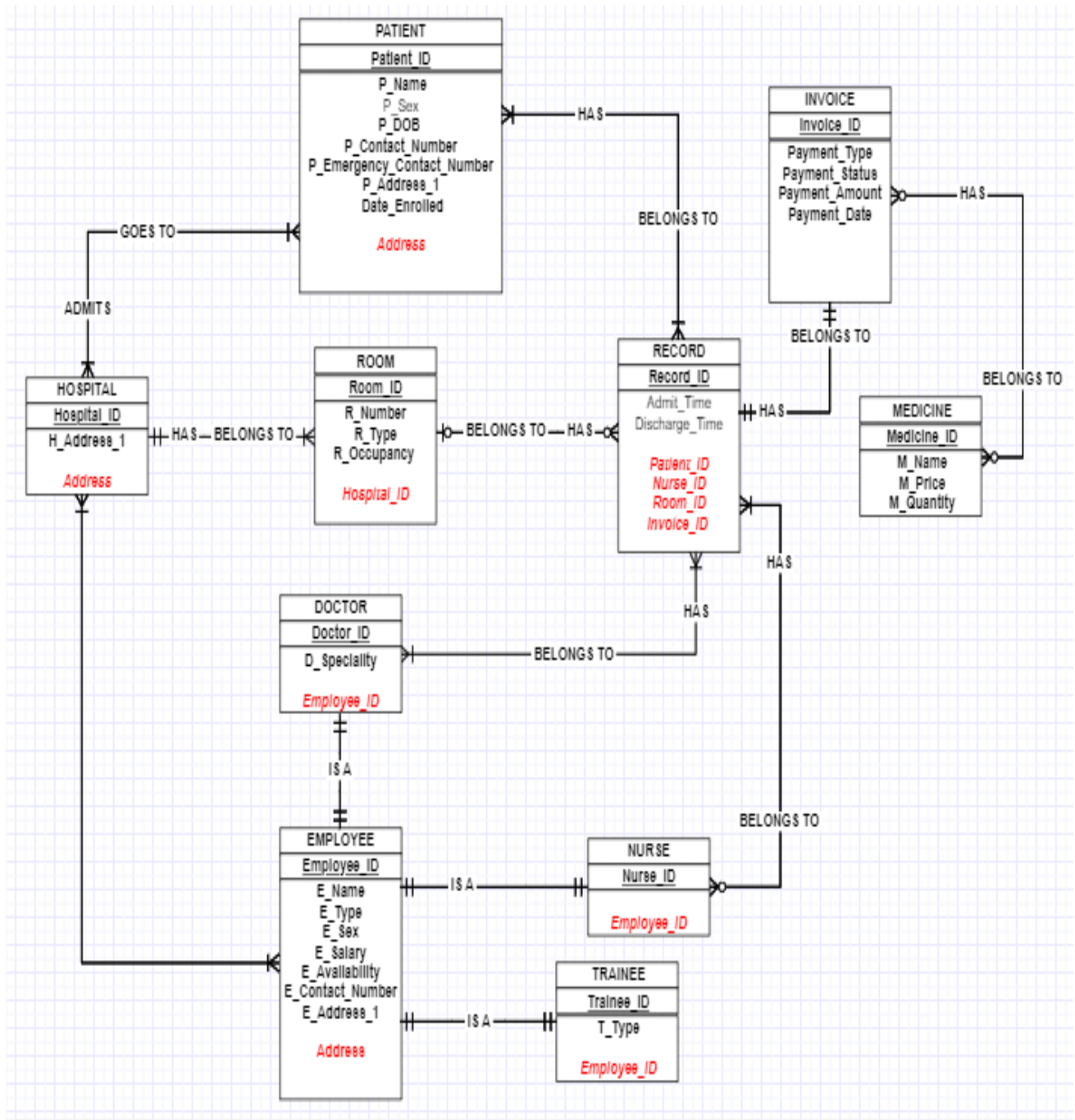
### 3) Entity & Attribute Identification:

Entities	Attributes	Name Relationship
Patient	<b><u>Patient ID</u></b> P_FName P_LName P_Sex P_DOB P_Contact_Number P_Emergency_Contact_Number P_Address_1 Date_Enrolled Address	- A Patient goes to a Hospital
Hospital	<b><u>Hospital ID</u></b> Address	- Hospital admits Patient - Hospital has employees - Hospital has Room
Employee	<b><u>Employee ID</u></b> E_FName E_LName E_MInitial E_Type E_Sex E_Salary E_Availability E_Contact_Number E_Address	- Employees work in a hospital
Doctor	<b><u>Doctor ID</u></b> D_Speciality <i>Employee_ID</i>	- A Doctor is an Employee - A Doctor belongs to Record
Nurse	<b><u>Nurse ID</u></b> <i>Employee_ID</i>	- A Nurse is an Employee - A Nurse belongs to Record
Trainee	<b><u>Trainee ID</u></b> <i>Employee_ID</i>	- A trainee is an Employee
Invoice	<b><u>Invoice ID</u></b> Payment_Type Payment_Status Payment_Amount Payment_Date <i>Medicine_ID</i>	- Invoice belongs to Record - Invoice has Medicine

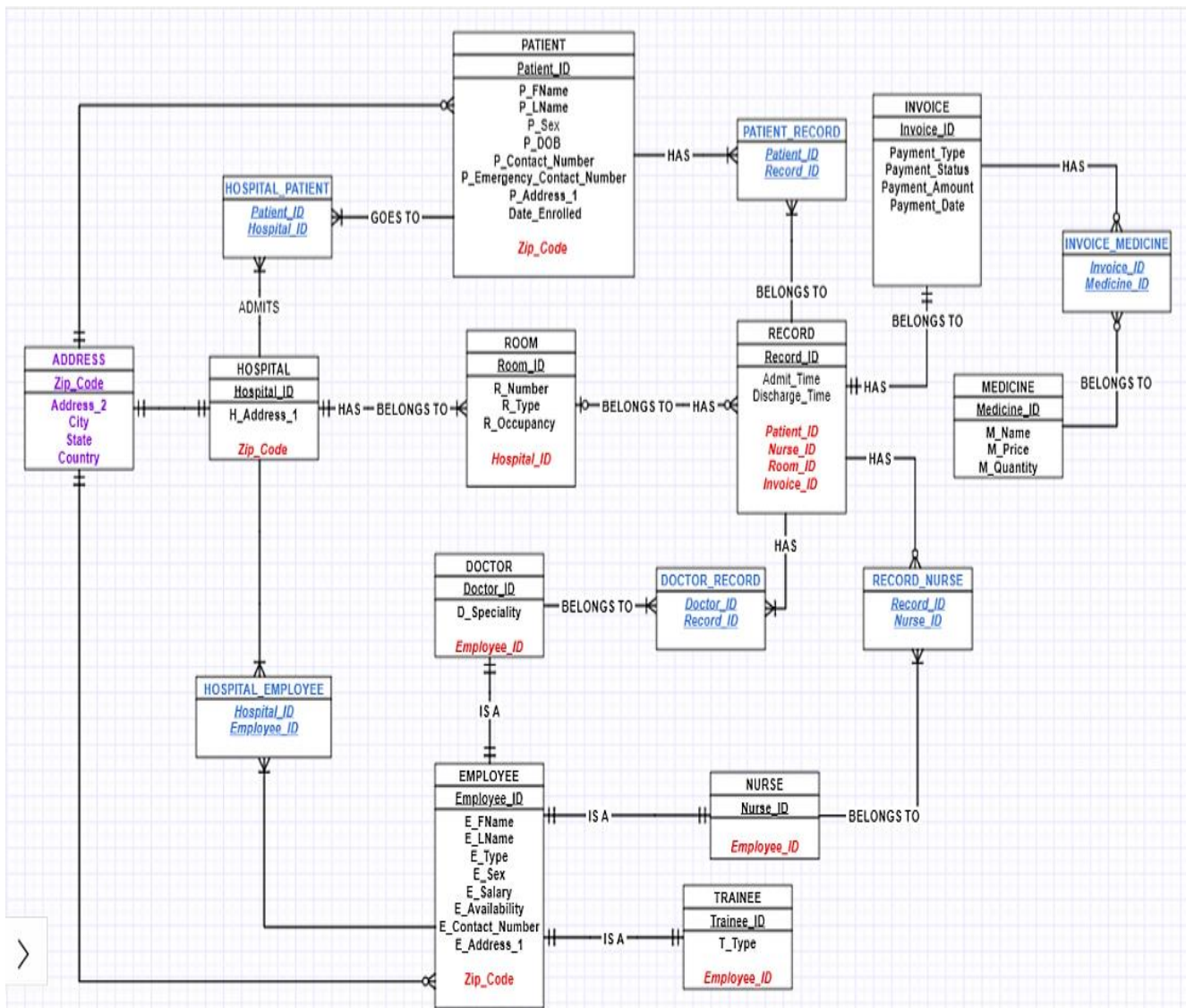
Record	<u>Record_ID</u> <b>Admit_Time</b> <b>Discharge_Time</b> <i>Patient_ID</i> <i>Doctor_ID</i> <i>Nurse_ID</i> <i>Room_ID</i> <i>Invoice_ID</i>	<ul style="list-style-type: none"> <li>- <b>A Record has Invoice</b></li> <li>- <b>A Record has a Room</b></li> <li>- <b>A Record has Doctor</b></li> <li>- <b>A Record has a Nurse</b></li> </ul>
Room	<b><u>Room_ID</u></b> R_Number R_Type R_Occupancy <i>Hospital_ID</i>	<ul style="list-style-type: none"> <li>- A Room belongs to Hospital</li> <li>- A Room belongs to Record</li> </ul>
Medicine	<b><u>Medicine_ID</u></b> M_Name M_Price M_Quantity	<ul style="list-style-type: none"> <li>- The Medicine belongs to Invoice</li> </ul>

# Conceptual Model

## 4) ER diagram:



### 5) ER diagram with Many-to-many relationship resolved:





# Logical Model

## 6) Database Normalized to 3NF:

Address Table:

	Zip_Code	Address_2	City	_State	Country
1	B3L 1G6	6208 Allan st	Halifax	Nova Scotia	Canada
2	H3G 2A8	3678 Rue de la	Montreal	Quebec	Canada
3	H4V 2A4	5416 Rue west	Montreal	Quebec	Canada
4	L7C 2H5	14783 Kennedy rd	Inglewood	Ontario	Canada
5	M2R 2R6	334 Moore park av	North York	Ontario	Canada
6	M3J 2V7	35 Fountain head road	North York	Ontario	Canada
7	T2S 0M9	622 Hillcrest ave	Calgary	Alberta	Canada
8	T2T 2T3	1916 48 Ave SW	Calgary	Alberta	Canada
9	V5X 4J2	6596 Culloden st	Vancouver	British Columbia	Canada
10	V6M 2V9	5750 Oak st	Vancouver	British Columbia	Canada

Patient Table:

	Patient_ID	P_FName	P_LName	P_Sex	P_DOB	P_Contact_Number	P_Emergency_Contact_Number	P_Address_1	Date Enrolled	Zip_Code
1	10	Ortensia	Franceschelli	F	04.11.2009 00:00:00	6619523827	5121912111	70983 8th Point	21.09.2019 00:00:00	M3J 2V7
2	11	Ingram	Laxtonne	M	17.05.1998 00:00:00	8669988656	6249240046	5341 Moose Road	21.12.2019 00:00:00	M2R 2R6
3	12	Sylvester	Searjeant	M	25.08.1987 00:00:00	6373561312	4817810654	5558 Jackson Avenue	18.07.2019 00:00:00	L7C 2H5
4	13	Raviv	Plomer	M	26.03.1982 00:00:00	2724451176	8807267565	01161 Huxley Pass	06.01.2020 00:00:00	H4V 2A4
5	14	Cecile	Guise	F	22.05.1993 00:00:00	8868585826	7886018615	09564 Lyons Point	04.05.2019 00:00:00	H3G 2A8
6	15	Ashton	Howorth	M	16.03.2000 00:00:00	574157573	6268695937	9772 Mifflin Parkway	28.09.2019 00:00:00	V6M 2V9
7	16	Cassie	Hadwick	F	31.05.2001 00:00:00	8685683957	3588142697	001 Ridgeway Center	20.04.2019 00:00:00	V5X 4J2
8	17	Trevor	Chetwynd	M	27.01.1984 00:00:00	7416421270	2550419114	665 Utah Avenue	08.11.2019 00:00:00	T2S 0M9
9	18	Lamar	Peckitt	M	22.07.2002 00:00:00	8297588150	6359545984	482 Lindbergh Lane	04.07.2019 00:00:00	T2T 2T3
10	19	Emerson	Gaynsford	M	01.10.2005 00:00:00	4820787784	4201178304	7909 Clarendon Crossing	09.02.2020 00:00:00	B3L 1G6

Hospital Table:

	Hospital_ID	Zip_Code
1	AB00000011	T2S 0M9
2	AB00000022	T2T 2T3
3	BC00000011	V6M 2V9
4	BC00000022	V5X 4J2
5	NS00000011	B3L 1G6
6	ON00000011	M2R 2R6
7	ON00000022	M3J 2V7
8	ON00000033	L7C 2H5
9	QC00000011	H4V 2A4
10	QC00000022	H3G 2A8

**Hospital\_Patient Junction Table:**

	Hospital_ID	Patient_ID
1	AB00000011	17
2	AB00000022	18
3	BC00000011	15
4	BC00000022	16
5	NS00000011	19
6	ON00000011	10
7	ON00000022	11
8	ON00000033	12
9	QC00000011	13
10	QC00000022	14

**Rooms Table:**

	Room_ID	R_Number	R_Type	R_Occupancy	Hospital_ID
1	AB80	8	SD	False	AB00000011
2	AB90	9	D	True	AB00000011
3	BC40	4	SD	False	BC00000011
4	BC50	5	SD	True	BC00000022
5	NS00	10	G	True	NS00000011
6	ON10	1	D	False	ON00000011
7	ON20	2	D	True	ON00000022
8	ON30	3	G	True	ON00000033
9	QC60	6	D	False	QC00000011
10	QC70	7	D	False	QC00000011

**Employees Table:**

	Employee_ID	E FName	E LName	E MInitial	E_Type	E Sex	E Salary	E Availability	E Contact Number	E Address_1	Zip Code
1	10000	Melantha	Gerold	D	D	F	35000	False	4047109861	4 Jackson Avenue	M2R 2R6
2	10001	Stephie	Hagston	P	D	F	65000	True	2829208643	6 Dawn Drive	B3L 1G6
3	20000	Elbert	Armatage	T	D	M	40000	False	8174952468	2 Center Hill	M3J 2V7
4	30000	Kenon	McFie	R	N	M	15000	True	3248376383	2677 Bartillon Point	L7C 2H5
5	40000	Karolina	Van	D	T	F	10000	True	5781282412	109 South Point	V6M 2V9
6	50000	Jayne	Oliver	D	T	M	11000	True	1027811274	60891 Moose Circle	V5X 4J2
7	60000	Ermin	Schruurs	O	D	M	75000	False	6811487542	29 Lakewood Point	H4V 2A4
8	70000	Lazaro	Vedstra	Z	N	M	8000	True	1692732049	4 Hovde Road	H3G 2A8
9	80000	Fairleigh	Bancroft	N	T	M	9000	True	5959232643	398 Victoria Crossing	T2S 0M9
10	90000	Berkie	Lowth	V	D	M	70000	False	1119752807	69875 Wayridge Road	T2T 2T3

**Hospital\_Employee Junction Table:**

	Hospital_ID	Employee_ID
1	AB00000011	80000
2	AB00000022	90000
3	BC00000011	40000
4	BC00000022	50000
5	NS00000011	10001
6	ON00000011	10000
7	ON00000022	20000
8	ON00000033	30000
9	QC00000011	60000
10	QC00000022	70000

**Nurse Table:**

	Nurse_ID	Employee_ID
1	ON00000111	30000
2	QC00000111	70000

**Trainee Table:**

	Trainee_ID	T_Type	Employee_ID
1	AB00000111	Intermediate	80000
2	BC00000111	Beginnner	40000
3	BC00000222	Expert	50000

**Doctor Table:**

	Doctor_ID	D_Speciality	Employee_ID
1	AB00000222	Gynacology	90000
2	NS00000111	Cardiologists	10001
3	ON00000222	Heart	10000
4	ON00000333	Arthrities	20000
5	QC00000222	Diabities	60000

**Medicine Table:**

	Medicine_ID	M_Name	M_Price	M_Quantity
1	C000	Codeine	17	90
2	ER00	Eryc	10	100
3	FE00	Fenofibrate	8	59
4	GU00	Gunar	19	80
5	KA00	Kadian	5	70
6	KE00	Keflex	27	39
7	KI00	Kineret	15	75
8	MA00	Macugen	6	110
9	SA00	Sam	13	60
10	SE00	Seward	21	45

**Invoice Table:**

	Invoice_ID	Payment_Type	Payment_Status	Payment_Amount	Payment_Date
1	3282474857	Debit	True	145	07.12.2019 00:00:00
2	3403356922	Cash	True	636	08.11.2019 00:00:00
3	3677986516	Visa	False	19	21.11.2019 00:00:00
4	4085249509	Debit	False	580	06.05.2019 00:00:00
5	5096363007	Cash	False	789	14.04.2019 00:00:00
6	6823866918	Master	True	17	13.12.2010 00:00:00
7	7729358700	Master	False	23	25.04.2019 00:00:00
8	8015494656	Visa	True	497	08.06.2015 00:00:00
9	9037820425	Cash	False	734	04.08.2019 00:00:00
10	9178383390	Debit	False	22	03.03.2020 00:00:00

**Invoice\_Medicine Junction Table:**

	Invoice_ID	Medicine_ID
1	3282474857	SE00
2	3403356922	KI00
3	3677986516	KA00
4	4085249509	SA00
5	5096363007	ER00
6	6823866918	MA00
7	7729358700	CO00
8	8015494656	GU00
9	9037820425	KE00
10	9178383390	FE00

**Record Table:**

	Record_ID	Admit_Time	Discharge_Time	Patient_ID	Nurse_ID	Room_ID	Invoice_ID
1	09048824AB	09:25:00	12:30:00	17	QC00000111	AB80	8015494656
2	250111890N	02:50:00	04:55:00	10	ON00000111	ON10	5096363007
3	34170413NS	10:36:00	20:05:00	19	QC00000111	NS00	6823866918
4	35253991AB	12:21:00	18:51:00	18	QC00000111	AB90	7729358700
5	790623650N	10:01:00	12:39:00	12	ON00000111	ON30	9037820425
6	796155120N	05:48:00	08:32:00	11	ON00000111	ON20	3403356922
7	79917129QC	04:07:00	10:14:00	16	QC00000111	QC70	3677986516
8	81922465QC	06:52:00	11:50:00	15	ON00000111	QC60	4085249509
9	90248122BC	02:43:00	10:19:00	13	ON00000111	BC40	3282474857
10	98493358BC	06:05:00	09:15:00	14	ON00000111	BC50	9178383390

**Patient\_Record Junction Table:**

	Patient_ID	Record_ID
1	10	250111890N
2	11	796155120N
3	12	790623650N
4	13	90248122BC
5	14	98493358BC
6	15	81922465QC
7	16	79917129QC
8	17	09048824AB
9	18	35253991AB
10	19	34170413NS

**Doctor\_Record Junction Table:**

	Doctor_ID	Record_ID
1	AB00000222	09048824AB
2	AB00000222	35253991AB
3	NS00000111	34170413NS
4	ON00000222	25011189ON
5	ON00000222	79615512ON
6	ON00000333	79062365ON
7	ON00000333	90248122BC
8	QC00000222	79917129QC
9	QC00000222	81922465QC
10	QC00000222	98493358BC

**Nurse\_Record Junction Table:**

	Nurse_ID	Record_ID
1	ON00000111	25011189ON
2	ON00000111	79062365ON
3	ON00000111	79615512ON
4	ON00000111	79917129QC
5	ON00000111	81922465QC
6	ON00000111	90248122BC
7	ON00000111	98493358BC
8	QC00000111	09048824AB
9	QC00000111	34170413NS
10	QC00000111	35253991AB

# Physical Model

## 7) Table format along with business rules and constraints:

Address		
Attributes	DataType	Constraints
Zip_Code	VARCHAR(7)	Primary Key, Zip_Code LIKE '[A-Z][0-9][A-Z] [0-9][A-Z][0-9]'
Address_2	VARCHAR(30)	Not Null
City	VARCHAR(15)	Not Null, City NOT LIKE '%[^a-z ]%'
_State	VARCHAR(20)	Not Null
Country	VARCHAR(20)	Not Null

Patient		
Attributes	DataType	Constraints
Patient_ID	DECIMAL(10)	Primary Key, Patient_ID NOT LIKE '%[^A-Z 0-9]%'
P_FName	VARCHAR(15)	Not Null
P_LName	VARCHAR(15)	Not Null
P_Sex	CHAR(1)	P_Sex IN ('M','F')
P_DOB	DATE	P_DOB >= '1920-01-01' AND P_DOB <= GETDATE()
P_Contact_Number	DECIMAL(10)	Not Null
P_Emergency_Contact_Number	DECIMAL(10)	Not Null
P_Address_1	VARCHAR(40)	Not Null
Date_Enrolled	DATE	DATE_ENROLLED <= GETDATE()
Zip_Code	VARCHAR(7)	Foreign Key

Hospital		
Attributes	DataType	Constraints
Hospital_ID	VARCHAR(10)	Primary Key, Hospital_ID NOT LIKE '%[^A-Z 0-9]%'
Zip_Code	VARCHAR(7)	Foreign Key

Hospital_Patient		
Attributes	DataType	Constraints
Hospital_ID	VARCHAR(10)	Primary Key, Foreign Key
Patient_ID	DECIMAL(10)	Primary Key, Foreign Key

Room		
Attributes	DataType	Constraints
Room_ID	VARCHAR(8)	Primary Key,
R_Number	INT	Not Null
R_Type	CHAR(2)	Not Null, (R_Type IN ('D','SD','G'))
R_Occupancy	BIT	Not Null, Default 0
Hospital_ID	VARCHAR(10)	Foreign Key

Employee		
Attributes	Data Type	Constraints
Employee_ID	INT	Primary Key
E_FName	VARCHAR(15)	Not Null
E_LName	VARCHAR(15)	Not Null
E_MInitial	CHAR(1)	Not Null
E_Type	CHAR(1)	E_Type IN ('D','N','T')
E_Sex	CHAR(1)	E_Sex IN ('M','F')
E_Salary	INT	E_Salary >= 2000 AND E_Salary <= 80000
E_Availability	BIT	Not Null, Default 1
E_Contact_Number	NUMERIC(10)	Not Null
E_Address_1	VARCHAR(50)	Not Null
Zip_Code	VARCHAR(7)	Foreign Key

Hospital_Employee		
Attributes	Data Type	Constraints
Hospital_ID	VARCHAR(10)	Primary Key, Foreign Key
Employee_ID	INT	Primary Key, Foreign Key

Nurse		
Attributes	Data Type	Constraints
Nurse_ID	VARCHAR(10)	Primary Key, Nurse_ID NOT LIKE '%[^A-Z 0-9]%'
Employee_ID	INT	Foreign Key

Trainee		
Attributes	Data Type	Constraints
Trainee_ID	VARCHAR(10)	Primary Key, Trainee_ID NOT LIKE '%[^A-Z 0-9]%'
T_Type	VARCHAR(15)	Not Null
Employee_ID	INT	Not Null, Foreign key

Doctor		
Attributes	Data Type	Constraints
Doctor_ID	VARCHAR(10)	Primary_Key
D_Speciality	VARCHAR(15)	NOT NULL
Employee_ID	INT	Foreign Key

Medicine		
Attributes	Data Type	Constraints
Medicine_ID	VARCHAR(20)	Primary_Key
M_Name	VARCHAR(15)	NOT NULL
M_Price	INT	NOT NULL
M_Quantity	INT	NOT NULL

Invoice		
Attributes	Data Type	Constraints
Invoice_ID	VARCHAR(15)	Primary_Key
Payment_Type	VARCHAR(15)	NOT NULL
Payment_Status	BIT	NOT NULL
Payment_Amount	INT	NOT NULL
Payment_Date	DATE	NOT NULL, Payment_Date <= GETDATE()

Invoice_Medicine		
Attributes	Data Type	Constraints
Invoice_ID	VARCHAR(15)	Primary_Key, Foreign Key
Medicine_ID	VARCHAR(20)	Primary Key, Foreign Key

Record		
Attributes	Data Type	Constraints
Record_ID	VARCHAR(10)	Primary_Key
Admit_Time	TIME	NOT NULL
Discharge_Time	TIME	NOT NULL, Discharge_Time > Admit_Time
Patient_ID	DECIMAL(10)	Foreign Key
Nurse_ID	VARCHAR(10)	Foreign Key
Room_ID	VARCHAR(8)	Foreign Key
Invoice_ID	VARCHAR(15)	Foreign Key

Patient_Record		
Attributes	Data Type	Constraints
Patient_ID	DECIMAL(10)	Primary_Key, Foreign Key
Record_ID	VARCHAR(10)	Primary_Key, Foreign Key

Doctor_Record		
Attributes	Data Type	Constraints
Doctor_ID	DECIMAL(10)	Primary_Key, Foreign Key
Record_ID	VARCHAR(10)	Primary_Key, Foreign Key

Nurse_Record		
Attributes	Data Type	Constraints
Nurse_ID	DECIMAL(10)	Primary_Key, Foreign Key
Record_ID	VARCHAR(10)	Primary_Key, Foreign Key



## 8) Implementing Database using SQL Query:

- **Creating Database and using it:**

```
GO
CREATE DATABASE MyDBProj
GO

GO
USE MyDBProj
GO
```

- **Creating Address Table:**

```
GO
CREATE TABLE Address(
Zip_Code VARCHAR(7),
Address_2 VARCHAR(30) NOT NULL,
City VARCHAR(15) NOT NULL,
_State VARCHAR(20) NOT NULL,
Country VARCHAR(20) NOT NULL,

CONSTRAINT PK_Address PRIMARY KEY(Zip_Code)
);
GO
```

- **Adding Constraints for Address Table:**

```
--Constraints
GO
ALTER TABLE Address_
ADD CONSTRAINT CHK_Zip_Code
CHECK (Zip_Code LIKE '[A-Z][0-9][A-Z][0-9][A-Z][0-9]'),

CONSTRAINT CHK_City
CHECK (City NOT LIKE '%[^a-z ]%');
GO
```

- **Creating Patient Table:**

```
GO
CREATE TABLE Patient(
Patient_ID DECIMAL(10),
P_FName VARCHAR(15) NOT NULL,
P_LName VARCHAR(15) NOT NULL,
P_Sex CHAR(1) NOT NULL,
P_DOB DATE NOT NULL,
P_Contact_Number DECIMAL(10) NOT NULL,
P_Emergency_Contact_Number DECIMAL(10) NOT NULL,
P_Address_1 VARCHAR(40) NOT NULL,
Date_Enrolled DATE NOT NULL,

Zip_Code VARCHAR(7) NOT NULL,

CONSTRAINT PK_Patient PRIMARY KEY(Patient_ID),
CONSTRAINT FK_Patient_Address FOREIGN KEY (Zip_Code) REFERENCES
Address_(Zip_Code)
);
GO
```

- **Adding Constraints for Patient Table:**

```
--Constraints
GO
ALTER TABLE Patient
ADD CONSTRAINT CHK_Patient_ID
CHECK (Patient_ID NOT LIKE '%[^A-Z 0-9]%' ),

CONSTRAINT CHK_Patient_Sex
CHECK (P_Sex IN ('M','F')),

CONSTRAINT CHK_P_DOB
CHECK (P_DOB >= '1920-01-01' AND P_DOB <= GETDATE()),

CONSTRAINT CHK_DATE_ENROLLED
CHECK (DATE_ENROLLED <= GETDATE());
GO
```

- **Creating Hospital Table:**

```
GO
CREATE TABLE Hospital(
Hospital_ID VARCHAR(10),
Zip_Code VARCHAR(7) NOT NULL,

CONSTRAINT PK_Hospital PRIMARY KEY(Hospital_ID),
CONSTRAINT FK_Zip_Code FOREIGN KEY (Zip_Code) REFERENCES Address_(Zip_Code)
);
GO
```

- **Adding Constraints for Hospital Table:**

```
--Constraints
GO
ALTER TABLE Hospital
ADD CONSTRAINT CHK_Hospital_ID
CHECK (Hospital_ID NOT LIKE '%[^A-Z 0-9]%' );
GO
```

- **Creating Hospital\_Patient Table:**

```
GO
CREATE TABLE Hospital_Patient(
Hospital_ID VARCHAR(10) NOT NULL,
Patient_ID DECIMAL(10) NOT NULL,
CONSTRAINT PK_Hospital_Patient PRIMARY KEY
(
    Hospital_ID,
    Patient_ID
),
CONSTRAINT FK_Hospital FOREIGN KEY (Hospital_ID) REFERENCES
Hospital(Hospital_ID),
CONSTRAINT FK_Patient FOREIGN KEY (Patient_ID) REFERENCES
Patient(Patient_ID)
)
GO
```

- **Creating Room Table:**

```
GO
CREATE TABLE Room(
Room_ID varchar(8),
R_Number INT NOT NULL,
R_Type CHAR(2) NOT NULL, --check
R_Occupancy BIT DEFAULT 0,
Hospital_ID VARCHAR(10),

CONSTRAINT PK_Room PRIMARY KEY (Room_ID),
CONSTRAINT FK_Room_Hospital FOREIGN KEY (Hospital_ID) REFERENCES
Hospital(Hospital_ID)
);
GO
```

- **Adding Constraints for Room Table:**

```
--Constraints
GO
ALTER TABLE ROOM
ADD CONSTRAINT CHK_Room_Type
CHECK (R_Type IN ('D', 'SD', 'G'))
GO
```

- **Creating Employee Table:**

```
GO
CREATE TABLE Employee(
Employee_ID INT NOT NULL,
E_FName VARCHAR(15) NOT NULL,
E_LName VARCHAR(15) NOT NULL,
E_MInitial CHAR(1),
E_Type CHAR(1) NOT NULL,
E_Sex CHAR(1) NOT NULL,
E_Salary INT NOT NULL,
E_Availability BIT NOT NULL DEFAULT 1,
E_Contact_Number NUMERIC(10) NOT NULL,
E_Address_1 VARCHAR(50) NOT NULL,
Zip_Code varchar(7) NOT NULL,

CONSTRAINT PK_Employee PRIMARY KEY(Employee_ID),
CONSTRAINT FK_Employee_Address FOREIGN KEY (Zip_Code) REFERENCES
Address_(Zip_Code),

);
GO
```

- **Adding Constraints for Employee Table:**

```
GO
ALTER TABLE Employee
ADD CONSTRAINT CHK_SEX
CHECK (E_Sex IN ('M','F')),

CONSTRAINT CHK_Employee_TYPE
CHECK (E_Type IN ('D','N','T')),
CONSTRAINT CHK_E_Salary
CHECK (E_Salary >= 2000 AND E_Salary <= 80000);
GO
```

- **Creating Hospital\_Employee Table:**

```
GO
CREATE TABLE Hospital_Employee(
Hospital_ID VARCHAR(10) NOT NULL,
Employee_ID INT NOT NULL,

CONSTRAINT PK_HOSPITAL_EMPLOYEE PRIMARY KEY(
Hospital_ID,
Employee_ID
),
CONSTRAINT FK_HospitalEmployee_Hospital FOREIGN KEY (Hospital_ID)
REFERENCES Hospital(Hospital_ID),
CONSTRAINT FK_HospitalEmployee_Employee FOREIGN KEY (Employee_ID)
REFERENCES Employee(Employee_ID)
);
```

- **Creating Nurse Table:**

```
GO
CREATE TABLE Nurse(
Nurse_ID VARCHAR(10) NOT NULL,
Employee_ID INT NOT NULL,

CONSTRAINT PK_Nurse PRIMARY KEY (Nurse_ID),
CONSTRAINT FK_Nurse_Employee FOREIGN KEY (Employee_ID) REFERENCES
Employee(Employee_ID)
);
GO
```

- **Adding Constraints for Nurse Table:**

```
GO
ALTER TABLE Nurse
ADD CONSTRAINT CHK_Nurse_ID
CHECK (Nurse_ID NOT LIKE '%[^A-Z 0-9]%');
GO
```

- **Creating Trainee Table:**

```
GO
CREATE TABLE Trainee(
Trainee_ID VARCHAR(10) NOT NULL,
T_Type VARCHAR(15) NOT NULL,
Employee_ID INT NOT NULL,

CONSTRAINT PK_Trainee PRIMARY KEY (Trainee_ID),
CONSTRAINT FK_Trainee_Nurse FOREIGN KEY (Employee_ID) REFERENCES
Employee(Employee_ID)
);
GO
```

- **Adding Constraints for Trainee Table:**

```
GO
ALTER TABLE Trainee
ADD CONSTRAINT CHK_Trainee_ID
CHECK (Trainee_ID NOT LIKE '%[^A-Z 0-9]%');
GO
```

- **Creating Doctor Table:**

```
GO
CREATE TABLE DOCTOR(
Doctor_ID VARCHAR(10) NOT NULL,
D_Speciality VARCHAR(15) NOT NULL,
Employee_ID int NOT NULL,

CONSTRAINT PK_Doctor PRIMARY KEY (Doctor_ID),
CONSTRAINT FK_Employee FOREIGN KEY (Employee_ID) REFERENCES
Employee(Employee_ID),
);
GO
```

- **Creating Medicine Table:**

```
GO
CREATE TABLE Medicine(
Medicine_ID VARCHAR(20),
M_Name VARCHAR(15) NOT NULL,
M_Price INT NOT NULL,
M_Quantity INT NOT NULL,

CONSTRAINT PK_Medicine PRIMARY KEY (Medicine_ID)
);
GO
```

- **Creating Invoice Table:**

```
GO
CREATE TABLE Invoice(
Invoice_ID VARCHAR(15) NOT NULL,
Payment_Type VARCHAR(15) NOT NULL,
Payment_Status BIT NOT NULL DEFAULT 0,
Payment_Amount INT NOT NULL,
Payment_Date DATE NOT NULL,

CONSTRAINT PK_Invoice PRIMARY KEY (Invoice_ID),
);
GO
```

- **Adding Constraints for Invoice Table:**

```
GO
ALTER TABLE Invoice
ADD CONSTRAINT CHK_Payment_Date
CHECK (Payment_Date <= GETDATE());
GO
```

- **Creating Invoice\_Medicine Table:**

```
GO
CREATE TABLE Invoice_Medicine(
Invoice_ID VARCHAR(15) NOT NULL,
Medicine_ID VARCHAR(20) NOT NULL,
CONSTRAINT PK_Invoice_Medicine PRIMARY KEY(
    Invoice_ID,
    Medicine_ID
),

CONSTRAINT FK_InvoiceMedicine_Invoice FOREIGN KEY (Invoice_ID) REFERENCES
Invoice(Invoice_ID),
CONSTRAINT FK_InvoiceMedicine_Medicine FOREIGN KEY (Medicine_ID) REFERENCES
Medicine(Medicine_ID)
);
GO
```

- **Creating Record Table:**

```
GO
CREATE TABLE Record(
Record_ID VARCHAR(10),
Admit_Time TIME NOT NULL,
Discharge_Time TIME NOT NULL,
Patient_ID DECIMAL(10) NOT NULL,
Nurse_ID VARCHAR(10) NOT NULL,
Room_ID VARCHAR(8) NOT NULL,
Invoice_ID VARCHAR(15) NOT NULL,

CONSTRAINT PK_Record PRIMARY KEY (Record_ID),
CONSTRAINT FK_Record_Patient FOREIGN KEY (Patient_ID) REFERENCES
Patient(Patient_ID),
CONSTRAINT FK_Record_Nurse FOREIGN KEY (Nurse_ID) REFERENCES
Nurse(Nurse_ID),
CONSTRAINT FK_Record_Room FOREIGN KEY (Room_ID) REFERENCES Room(Room_ID),
CONSTRAINT FK_Record_Invoice FOREIGN KEY (Invoice_ID) REFERENCES
Invoice(Invoice_ID),
);
GO
```

- **Adding Constraints for Invoice Table:**

```
GO
ALTER TABLE Record
ADD CONSTRAINT CHK_Admit_Time_Discharge_Time
CHECK (Discharge_Time > Admit_Time);
GO
```

- **Creating Patient\_Record Table:**

```
GO
CREATE TABLE Patient_Record(
Patient_ID DECIMAL(10) NOT NULL,
Record_ID varchar(10) not null,
CONSTRAINT PK_Patient_Record PRIMARY KEY(
    Patient_ID,
    Record_ID
),
CONSTRAINT FK_PatintRecord_Patient FOREIGN KEY (Patient_ID) REFERENCES
Patient(Patient_ID),
CONSTRAINT FK_PatientRecord_Record FOREIGN KEY (Record_ID) REFERENCES
Record(Record_ID)
);
```

- **Creating Doctor\_Record Table:**

```
GO
CREATE TABLE Doctor_Record(
Doctor_ID VARCHAR(10) NOT NULL,
Record_ID VARCHAR(10) not null,
CONSTRAINT PK_Doctor_Record PRIMARY KEY(
    Doctor_ID,
    Record_ID
),
CONSTRAINT FK_DoctorRecord_Doctor FOREIGN KEY (Doctor_ID) REFERENCES
Doctor(Doctor_ID),
CONSTRAINT FK_DoctorRecord_Record FOREIGN KEY (Record_ID) REFERENCES
Record(Record_ID)
);
GO
GO
```

- **Creating Nurse\_Record Table:**

```
GO
CREATE TABLE Nurse_Record(
Nurse_ID VARCHAR(10) NOT NULL,
Record_ID VARCHAR(10) NOT NULL,
CONSTRAINT PK_Nurse_Record PRIMARY KEY(
    Nurse_ID,
    Record_ID
),
CONSTRAINT FK_NurseRecord_Nurse FOREIGN KEY (Nurse_ID) REFERENCES
Nurse(Nurse_ID),
CONSTRAINT FK_NurseRecord_Record FOREIGN KEY (Record_ID) REFERENCES
Record(Record_ID)
)
GO
```



## 9) Constraint Testing

### • City Constraint

```
--Constraints
GO
ALTER TABLE Address_
ADD CONSTRAINT CHK_Zip_Code
CHECK (Zip_Code LIKE '[A-Z][0-9][A-Z] [0-9][A-Z][0-9]'),

CONSTRAINT CHK_City
CHECK (City NOT LIKE '%[^a-z ]%');
GO

--Inserting values
GO
insert into Address_ values ('M3J 2V7', '35 Fountain head road','North@York', 'Ontario', 'Canada');
insert into Address_ values ('M2R 2R6', '334 Moore park av','North York', 'Ontario', 'Canada');
```

100 %

Messages

Msg 547, Level 16, State 0, Line 102  
The INSERT statement conflicted with the CHECK constraint "CHK\_City".

### • Date Enrolled constraint

```
ALTER TABLE Patient
ADD CONSTRAINT CHK_Patient_ID
CHECK (Patient_ID NOT LIKE '%[^A-Z 0-9]%),

CONSTRAINT CHK_Patient_Sex
CHECK (P_Sex IN ('M','F')),

CONSTRAINT CHK_P_DOB
CHECK (P_DOB >= '1920-01-01' AND P_DOB <= GETDATE()),

CONSTRAINT CHK_DATE_ENROLLED
CHECK (DATE_ENROLLED <= GETDATE());
GO

--Inserting values
GO
insert into Patient values ('000000010', 'Ortensia', 'Franceschelli', 'F', '1998/11/4',
'6619523827', '5121912111', '70983 8th Point', '2020/9/21', 'M3J 2V7');
```

100 %

Messages

Msg 547, Level 16, State 0, Line 152  
The INSERT statement conflicted with the CHECK constraint "CHK\_DATE\_ENROLLED".

- **DOB Constraints:**

```

ALTER TABLE Patient
ADD CONSTRAINT CHK_Patient_ID
CHECK (Patient_ID NOT LIKE '%[^A-Z 0-9]%'),

CONSTRAINT CHK_Patient_Sex
CHECK (P_Sex IN ('M','F')),

CONSTRAINT CHK_P_DOB
CHECK (P_DOB >= '1920-01-01' AND P_DOB <= GETDATE()),

CONSTRAINT CHK_DATE_ENROLLED
CHECK (DATE_ENROLLED <= GETDATE());
GO

--Inserting values
GO
insert into Patient values ('000000010', 'Ortensia', 'Franceschelli', 'F', '1900/11/4',

```

100 %

Messages

Msg 547, Level 16, State 0, Line 152  
The INSERT statement conflicted with the CHECK constraint "CHK\_P\_DOB".

- **Employee Sex Constraint:**

```

GO
ALTER TABLE Employee
ADD CONSTRAINT CHK_SEX
CHECK (E_Sex IN ('M','F')),

CONSTRAINT CHK_Employee_TYPE
CHECK (E_Type IN ('D','N','T')),

CONSTRAINT CHK_E_Salary
CHECK (E_Salary >= 2000 AND E_Salary <= 80000);
GO

--Inserting values
GO
insert into Employee values ('11000', 'Melantha', 'Gerold', 'D', 'D', 'X', '

```

100 %

Messages

Msg 547, Level 16, State 0, Line 297  
The INSERT statement conflicted with the CHECK constraint "CHK\_SEX".

- Employee Salary constraint:

```

ALTER TABLE Employee
ADD CONSTRAINT CHK_SEX
CHECK (E_Sex IN ('M','F')),

CONSTRAINT CHK_Employee_TYPE
CHECK (E_Type IN ('D','N','T')),

CONSTRAINT CHK_E_Salary
CHECK (E_Salary >= 2000 AND E_Salary <= 80000);
GO

--Inserting values
GO
insert into Employee values ('11110', 'Melantha', 'Gerold', 'D', 'T', 'F', '100000',

```

100 %

Messages

Msg 547, Level 16, State 0, Line 297  
The INSERT statement conflicted with the CHECK constraint "CHK\_E\_Salary".

- Employee type constraint:

```

--
ALTER TABLE Employee
ADD CONSTRAINT CHK_SEX
CHECK (E_Sex IN ('M','F')),

CONSTRAINT CHK_Employee_TYPE
CHECK (E_Type IN ('D','N','T')),

CONSTRAINT CHK_E_Salary
CHECK (E_Salary >= 2000 AND E_Salary <= 80000);
GO

--Inserting values
GO
insert into Employee values ('11100', 'Melantha', 'Gerold', 'D', 'F', 'F', '35000'

```

100 %

Messages

Msg 547, Level 16, State 0, Line 297  
The INSERT statement conflicted with the CHECK constraint "CHK\_Employee\_TYPE".

- Hospital Constraint:

```

--Constraints
GO
ALTER TABLE Hospital
ADD CONSTRAINT CHK_Hospital_ID
CHECK (Hospital_ID NOT LIKE '%[^A-Z 0-9]%');
GO

--Inserting values
GO
insert into Hospital values ('ON-----11', 'M2R 2R6');

```

100 %

Messages

Msg 547, Level 16, State 0, Line 184  
The INSERT statement conflicted with the CHECK constraint "CHK\_Hospital\_ID".

- Invoice Pay date constraint

```
--Constraint
GO
ALTER TABLE Invoice
ADD CONSTRAINT CHK_Payment_Date
CHECK (Payment_Date <= GETDATE());
GO

--Inserting value
GO
insert into Invoice values ('5006363007', 'Cash', 0, '789', '2021/4/14');
```

100 %

Messages

Msg 547, Level 16, State 0, Line 464  
The INSERT statement conflicted with the CHECK constraint "CHK\_Payment\_Date".

- Nurse ID constraint

```
GO
ALTER TABLE Nurse
ADD CONSTRAINT CHK_Nurse_ID
CHECK (Nurse_ID NOT LIKE '%[^A-Z 0-9]%');
GO

--Inserting values
GO
insert into Nurse values ('ON-----111', '30000');
```

100 %

Messages

Msg 547, Level 16, State 0, Line 361  
The INSERT statement conflicted with the CHECK constraint "CHK\_Nurse\_ID".

- Patient ID constraint

```
ALTER TABLE Patient
ADD CONSTRAINT CHK_Patient_ID
CHECK (Patient_ID NOT LIKE '%[^A-Z 0-9]%'),

CONSTRAINT CHK_Patient_Sex
CHECK (P_Sex IN ('M', 'F')),

CONSTRAINT CHK_P_DOB
CHECK (P_DOB >= '1920-01-01' AND P_DOB <= GETDATE()),

CONSTRAINT CHK_DATE_ENROLLED
CHECK (DATE_ENROLLED <= GETDATE());
GO

--Inserting values
GO
insert into Patient values ('-000000010', 'Ortensia', 'Franceschelli', 'F', '200
```

100 %

Messages

Msg 547, Level 16, State 0, Line 152  
The INSERT statement conflicted with the CHECK constraint "CHK\_Patient\_ID".

- Record Discharge Constraint:

```
--Constraints
GO
ALTER TABLE Record
ADD CONSTRAINT CHK_Admit_Time_Discharge_Time
CHECK (Discharge_Time > Admit_Time);
GO

--Inserting values
GO
insert into Record values ('250110890N', '2:50', '1:55', '0000000010', 'ON0000011'
```

100 %

Messages

Msg 547, Level 16, State 0, Line 535  
The INSERT statement conflicted with the CHECK constraint "CHK\_Admit\_Time\_Discharge\_Time".

- Roomtype Constraint

```
GO
ALTER TABLE ROOM
ADD CONSTRAINT CHK_Room_TYPE
CHECK (R_Type IN ('D','SD','G'))
GO

--Inserting values
GO
insert into Room values ('ON11', 1, 'XX', 0, 'ON00000011');
```

100 %

Messages

Msg 547, Level 16, State 0, Line 248  
The INSERT statement conflicted with the CHECK constraint "CHK\_Room\_TYPE".

- Sex Constraint

```
ALTER TABLE Patient
ADD CONSTRAINT CHK_Patient_ID
CHECK (Patient_ID NOT LIKE '%[^A-Z 0-9]%'),

CONSTRAINT CHK_Patient_Sex
CHECK (P_Sex IN ('M','F')),

CONSTRAINT CHK_P_DOB
CHECK (P_DOB >= '1920-01-01' AND P_DOB <= GETDATE()),

CONSTRAINT CHK_DATE_ENROLLED
CHECK (DATE_ENROLLED <= GETDATE());
GO

--Inserting values
GO
insert into Patient values ('0000000010', 'Ortensia', 'Franceschelli', 'K', '2009/:
```

100 %

Messages

Msg 547, Level 16, State 0, Line 152  
The INSERT statement conflicted with the CHECK constraint "CHK\_Patient\_Sex".

- Trainee ID Constraint

```
GO
ALTER TABLE Trainee
ADD CONSTRAINT CHK_Trainee_ID
CHECK (Trainee_ID NOT LIKE '%[^A-Z 0-9]%');
GO

--Insetting values
GO
insert into Trainee values ('BC/////111', 'Beginnner', '40000');
```

100 %

Messages

Msg 547, Level 16, State 0, Line 387  
The INSERT statement conflicted with the CHECK constraint "CHK\_Trainee\_ID".

- Zip Code Constraint

```
--Constraints
GO
ALTER TABLE Address_
ADD CONSTRAINT CHK_Zip_Code
CHECK (Zip_Code LIKE '[A-Z][0-9][A-Z] [0-9][A-Z][0-9]'),

CONSTRAINT CHK_City
CHECK (City NOT LIKE '%[^a-z ]%');
GO

--Inserting values
GO
insert into Address_ values ('M3J VV', '35 Fountain head road', 'North York', 'Ontario', 'Canada');
```

100 %

Messages

Msg 547, Level 16, State 0, Line 102  
The INSERT statement conflicted with the CHECK constraint "CHK\_Zip\_Code".