Programming Assignment 1

Task

Assume that you are working with a hospital and this hospital needs a software system to track its patients' information. Your role in this software development is to design the database. There are many aspects of such a hospital software system to develop. However, in this assignment, you will only address interactions between doctors and patients. Your first step will be to create the relations necessary for this system and identify and describe the constraints that would be appropriate for the relations. Currently, hospital representatives describe three entities: Doctor, Patient, and Appointment.

"Doctor" will need information such as a unique identifier for each doctor, doctor name, doctor phone, specialty number, and specialty.

"Patient" will need information such as a unique identifier for each patient, patient name, patient phone, patient e-mail, patient address, date added to the system, allergies (list of any known allergies), and doctor identifier (in our case each patient is admitted by one doctor).

Each patient is treated through appointments. Hence, there should be an "Appointment" relation. The "Appointment" will need information such as a unique identifier, appointment date, doctor and patient identifiers. During the appointment, treatment information such as blood pressure, pulse, treatment notes of the doctor, and medicines should also be included in the "Appointment" relation.

Be sure to identify what are the candidate, primary keys, and the degree of each relation. It would be recommended that you document your relations in the manner used in the Library Management System case study in chapter 3.3 of Sharma et al. (2010, 77).

After determining the relations, identify and describe the constraints that would be appropriate for the relations that we have within our hospital software system.

Constraints that you should consider may include:

Entity integrity constraint
Referential integrity constraint
Semantic integrity constraint
Domain constraint
Null constraint
Unique constraint

The constraints in <u>Bold</u> type should all be present in your assignment.

Assignment Instructions

1. Assignment should include the relations required for the hospital software system as follows:
Doctor
Patient
Appointment

2. Each relation must have identifiers and its data types

3. The degree of each relation must be described

4. Each relation must include appropriate information other than identifiers such as attributes and the data type of attributes

5. The "Doctor" relation should include at least a unique identifier for each doctor, doctor name, doctor phone, specialty number, and specialty

6. The "Patient" relation should include at least a unique identifier, patient name, patient phone, patient e-mail, patient address, patient added date, allergies, and doctor identifier.

7. The "Appointment" relation should include at least a unique identifier, appointment date, doctor and patient identifiers, blood pressure, pulse, treatment notes of doctor and medicines.

8. Identify and describe the constraints for each attribute

Entities

No.	Entity set	Type
1	DOCTOR	Strong
2	PATIENT	Strong
3	APPOINTMENT	Weak

Doctor Entity Set (**Degree:** The **Doctor** table has a degree of 5 (5 attributes)).

Attribute name	Type	Domain/ Data Type	Optional	Key
DOCTOR_ID	Unique Identifier	Numeric	No	Primary (Surrogate)
NAME	Composite Attribute	Text	No	
PHONE	Single-valued Attribute	Numeric	No	Candidate
SPECIALTY_CODE	Single-valued Attribute	Numeric	No	
SPECIALTY	Single-valued Attribute	Numeric	No	

Patient Entity Set (**Degree:** The **Patient** table has a degree of 8 (8 attributes)).

Attribute name	Type	Domain/ Data Type	Optional	Key
PATIENT_ID	Unique Identifier	Numeric	No	Primary (Surrogate)
NAME	Composite Attribute	Text	No	
PHONE	Single-valued Attribute	Numeric	No	Candidate
EMAIL	Single-valued Attribute	Text	Yes	
ADDRESS	Composite Attribute	Text	No	
ADDED_DATE	Single-valued Attribute	Date	No	
ALLERGIES	Multi-valued Attribute	Text	No	
DOCTOR_ID	Derived Attribute	Numeric	No	Foreign

Appointment Entity Set (**Degree:** The **Appointment** table has a degree of 8 (8 attributes)).

Attribute name	Type	Domain/ Data Type	Optional	Key
APPOINTMENT_ID	Unique Identifier	Numeric	No	Partial Discriminator (Surrogate)
DATE	Single-valued Attribute	Date	No	
DOCTOR_ID	Derived Attribute	Numeric	No	Foreign
PATIENT_ID	Derived Attribute	Numeric	No	Foreign
BLOOD_PRESSURE	Multi-valued Attribute	Numeric	No	
PULSE	Single-valued Attribute	Numeric	No	
MEDICINES	Multi-valued Attribute	Text	Yes	
TREATMENT_NOTES	Multi-valued Attribute	Text	No	

Constraints:

Doctor Entity Set

Attribute name	Type of Constraint	Explanation
DOCTOR_ID	Entity integrity constraint Unique constraint	No Primary Key can have **NULL** value The value must be unique to each tuple
NAME	Null constraint	The value of this attribute can't be **NULL**
PHONE	Null constraint	The value of this attribute can't be **NULL**
SPECIALTY_CODE	Null constraint	The value of this attribute can't be **NULL**
SPECIALTY	Null constraint	The value of this attribute can't be **NULL**

Patient Entity Set

Attribute name	Type of Constraint	Explanation
PATIENT_ID	Entity integrity constraint Unique constraint	No Primary Key can have **NULL** value The value must be unique to each tuple
NAME	Null constraint	The value of this attribute can't be **NULL**
PHONE	Null constraint	The value of this attribute can't be **NULL**
EMAIL	Unique constraint	If there is a value, must be unique to each tuple
ADDRESS	Null constraint	The value of this attribute can't be **NULL**
ADDED_DATE	Null constraint	The value of this attribute can't be **NULL**
ALLERGIES	Null constraint	The value of this attribute can't be **NULL** (Either list of allergies or "No allergies")
DOCTOR_ID	Referential integrity constraint -Cascade	If the Primary Key of Doctor Entity is updated, this is updated too.

Appointment Entity Set

Attribute name	Type of Constraint	Explanation
APPOINTMENT_ID	Unique constraint	The value must be unique to each tuple
DATE	Null constraint	The value of this attribute can't be **NULL**
DOCTOR_ID	Referential integrity constraint -Cascade	If the Primary Key of Doctor Entity is updated, this is updated too.
PATIENT_ID	Referential integrity constraint -Cascade	If the Primary Key of Patient Entity is updated, this is updated too.
BLOOD_PRESSURE	Null constraint	The value of this attribute can't be **NULL**
PULSE	Null constraint	The value of this attribute can't be **NULL**
MEDICINES	Null constraint	The value of this attribute can't be **NULL** (Either list of medicines or "No medicines")
TREATMENT_NOTES	Null constraint	The value of this attribute can't be **NULL**

References:

- MKS075 (2020, April 22).*Difference between Strong and Weak Entity* - GeeksforGeeks. https://www.geeksforgeeks.org/difference-between-strong-and-weak-entity/

- Sharma, N., Perniu, L., Chong, R. F., Iyer, A., Nandan, C., Mitea, A. C., Nonvinkere, M., & Danubianu, M. (2010). *Databases fundamentals.*IBM Corporation.

- Watt, A., & Eng, N. (2014). *Database design, 2nd ed.* BCcampus, BC Open Textbook Project. Retrieved from https://opentextbc.ca/dbdesign01/