

CST 8215 - Database
Test 2 - Part 2, Winter 2019, Blood-Donor

Last Name: _____ First Name: _____

Section Number: _____

Student Number: _____

Instructions:

1. Estimated time to assign to this exercise: 120 minutes.
2. Total Marks: 20.
3. Write your Last Name, First Name, Student Number and section number on this exam question paper. You name should be in the same order as in the college register and attendance sheet.
4. You need to answer questions based on sample data. Answer in the space provided after the question on the question paper itself.
5. Your handwriting and diagrams must be legible and neat to get complete marks for the question. You will lose marks if your answer is not readable.

PART II [20 Marks]

Blood-Donor - Normalization Exercise

Abstract A hospital wants to maintain a list of blood donors and recipients. It uses the table `Patient_T` that indicates if a patient is willing to donate blood. If a patient is in need for blood the clinic (or dentist office) can refer this database and contact a donor. A recipient can accept blood only from a compatible blood type. This data is indicated in the Red blood cell compatibility table at at the https://en.wikipedia.org/wiki/Blood_type, scroll down to the middle of the page; you can find several similar tables on the web. *Note:* Red Blood Cell Compatibility Table and Plasma compatibility tables are different. It is required that data is stored accurately, and queries are performed on this database. This application is critical, an error (i.e blood type mismatch) could result in loss of life. Sample data in unnormalized form is provided; not all possibilities of donor and recipient are covered in the sample data set. The complete set of donor and recipient can be determined from the compatibility table.

Rules:

1. There are a total of eight blood groups.
2. A Patient must have only one blood group; a patient cannot have more than one blood group.
3. More than one patient can have the same blood group.
4. There can be more than one donor of a blood group in the database.
5. A patient can receive a blood donation from more than one donor, the blood type must be compatible.
6. A donor is identified by a Y.
7. A patient who is not a donor, or does not wish to donate blood, is identified by N.
8. The sample (unnormalized) data does **not** show all possible blood groups from which a patient could receive blood; it shows possibly one or two compatible types. All compatible combinations are determined from the Red Blood Cell Compatibility Table.
9. A patient who is not a donor is eligible to receive blood from a donor.
10. A patient's blood group, shown as `PatientBloodGroup`, does not not change during the life of the patient.
11. A recipient can always receive blood from the same donor group. (And can also receive blood from other, compatible, blood group donors.)
12. *Aside:* The Patient data is compatible with the `Patient_T` table in the `Dentist` database from your practical exam.

Unnormalized Data:

```
PatientId, Patient_FirstName, Patient_LastName, Donor, PatientBloodGroup,  
RecipientBloodGroup, { DonorBloodGroup }
```

```
PATV01, Vixen, Taar, N, B+, B+, { B+ | O+ }  
PATG08, Gat, Gatup, Y, A-, A-, { A- | O- }  
PATs13, Sam, Somel, Y, O+, O+, { O+ }  
PATT07, Tap, Tapin, Y, O+, O+, { O+ | O- }
```

Question 1. [4 marks] Draw an logical ER diagram and then a physical ER diagram from the information given. Show all cardinality. Choose appropriate names for entities and tables.

Question 2. [4 Marks] Normalize the database to 1NF from the unnormalized data. Write the column names for each normal form; show data elements.

Question 3. [4 Marks] Normalize the database to 2NF. Write only the attributes; do not show data elements.

Question 4. [4 Marks] Normalize the database to 3NF. Write only the attributes; do not show data elements. In each of the tables indicate the number of rows each table will have.

Question 5. [4 Marks] Use JOIN clauses to simulate the results from 3NF to appear similar to your table in 1NF.