Middle East Technical University

Department of Computer Engineering

Ceng 302

Introduction to Database Management Systems
Fall 2014-2015-HW2

QUESTIONS

Consider the following relations for an imaginary database.

MEDICAL_RECORD(RecordNo,Type,Date,PatientID)
PATIENT(PatientID,Name,Sex,Birthday)
PHONE(PhoneID,PhoneNo)
P_PHONE(PatientID,PhoneID)

The current state of the database is given below:

MEDICAL_RECORD	RecordNo	Type	Date	PatientID
	1	Prescription	01.11.2012	900001
	2	Test Result	20.04.2013	900001
	3	EKG Image	13.06.2014	900001
	4	MR Image	13.06.2011	900002
	5	Test Result	11.01.2012	900002
	6	Prescription	11.04.2010	900004
	7	Other	06.09.2009	900006
	8	Test Result	16.07.2012	900008
	9	Prescription	06.02.2008	900003
	10	MR Image	12.01.2013	900005
	11	Test Result	15.05.2010	900007

PATIENT	PatientID	Name	Sex	Birthday
	900001	Ahmet	Male	01.03.1989
	900002	Melike	Female	11.04.1967
	900003	Hasan	Male	23.04.1949
	900004	Hikmet	Male	15.06.1996
	900005	Ceren	Female	10.10.1991
	900006	Sena	Female	29.10.1938
	900007	Zeynep	Female	23.05.1972
	900008	Murat	Male	01.12.1981

PHONE	PhoneID	PhoneNo
	10001	0-312-1111111
	10002	0-555-1234567
	10003	0-532-0246579
	10004	0-312-9999999
	10005	0-216-2002002
	10006	0-324-8765432
	10007	0-326-1001001
	10008	0-312-8888888
	10009	0-312-7777777

P_PHONE	PatientID	PhoneID
	900001	10001
	900001	10002
	900002	10003
	900002	10004
	900003	10006
	900004	10002
	900005	10003
	900006	10007
	900006	10005
	900007	10008
	900007	10009
	900008	10008

The business requirements are as follows:

- A medical record belongs to a particular patient.
- A patient may have multiple medical records.
- A patient may have multiple phone numbers, while a phone number may be owned by many patients (e.g. members of family).

1. Given the above relational schema, write the following queries using relational algebra.

a) List the name of the patients who are male and born before 1990.

b) List the record no of medical records of all patients except the patient having patient ID "900001".

c) List the name and phone number of patients who have at least one phone owned by another patient.

d) List the medical records of patients who have at least 2 medical records.

2. Given the above relational schema and database state, show the resulting relation(s) of the following relational algebra queries.

a) $\rho(A(1 \rightarrow PatientID1, 2 \rightarrow PhoneID1, 3 \rightarrow PatientID2, 4 \rightarrow PhoneID2), P\_PHONE \times P\_PHONE)$

$\rho(B, \Pi_{PatientID1,PhoneID1}(\sigma_{(PatientID1 \neq PatientID2) \wedge (PhoneID1=PhoneID2)}A))$

$\rho(C, \Pi_{PatientID1,PhoneID1}(\sigma_{(PatientID1 \neq PatientID2) \wedge (PhoneID1 \neq PhoneID2)}A))$

$\rho(RESULT, \Pi_{PatientID1,PhoneID1}C - \Pi_{PatientID1,PhoneID1}B))$

b) $\rho(X, \Pi_{PatientID}(\sigma_{PatientID<900005}PATIENT))$

$\rho(Y, \Pi_{PhoneID}(\sigma_{PhoneID<10007}PHONE))$

$\rho(Z, X \times \Pi_{PhoneID}PHONE)$

$\rho(RESULT, Z/Y)$

Regulations for HW2

- The homework must be completed individually; copying from others is strictly forbidden.

- You have to submit your homework as soft copy (in pdf format) through odtuclass.

- Unreadable handwritten homeworks (which you scanned) will NOT be evaluated.

- The deadline for the homework is 26.11.2014 23:55.

- Late homeworks will not be evaluated.