

CSIE4105 Database Systems

Homework # 2

Due on 10/30/2024

1. (30%) The Rolling Stones Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database. The data requirements are summarized as follows:

- Each musician that records at Rolling Stones has an SSN, a name, an address, and a phone number. Poorly paid musicians often share the same address, and no address has more than one phone.
- Each instrument used in songs recorded at Rolling Stones has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat).
- Each album recorded on the Rolling Stones label has a unique identification number, a title, a copyright date, a format (e.g., CD or MC), and an album identifier.
- Each song recorded at Rolling Stones has a title and an author.
- Each musician may play several instruments, and a given instrument may be played by several musicians.
- Each album has a number of songs on it, but no song may appear on more than one album.
- Each song is performed by one or more musicians, and a musician may perform a number of songs.
- Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.

Design a conceptual schema for Rolling Stones Records and draw an ER diagram for your schema. Be sure to indicate all **key**, **cardinality**, and **participation constraints** and state any *assumptions* you make.

2. (16%) Answer the following questions in EER modeling?
- (a) (8%) What are the differences between **hierarchy** and **lattice**?
 - (b) (8%) What are the differences between **shared subclass** and **category**?
3. (30%, each 5%) Suppose that each of the following *Update* operations is applied directly to the database state shown in the following figure. Discuss **all integrity constraints violated** by each operation, if any, and the different ways of **enforcing these constraints**.

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	NULL

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123456789	Michael	M	1988-01-04	Son
123456789	Alice	F	1988-12-30	Daughter
123456789	Elizabeth	F	1967-05-05	Spouse

- Insert <'Robert', 'F', 'Scott', '943775543', '1972-06-21', '2365 Newcastle Rd, Bellaire, TX', M, 58000, '888665555', 1> into EMPLOYEE.
 - Insert <'ProductA', 4, 'Bellaire', 2> into PROJECT.
 - Delete the DEPENDENT tuples with Essn = '987654321'.
 - Delete the PROJECT tuple with Pname = 'ProductX'.
 - Modify the Super_ssn attribute of the EMPLOYEE tuple with Ssn = '999887777' to '943775543'.
 - Modify the Pnumber attribute of the PROJECT tuple with Pnumber = 30 to 40
4. (24%) Translate the following EER diagram into a relational database schema. Indicate the **primary key** and **foreign key** (if any) for each relation. (Note: please

use **the foreign key approach** for 1:1 and 1:N relationships and the **multiple relations approach** for specification/generalization relationships).

