INFS1200/7900 Tutorial 2.1: Relational Model – Worksheet

Introduction

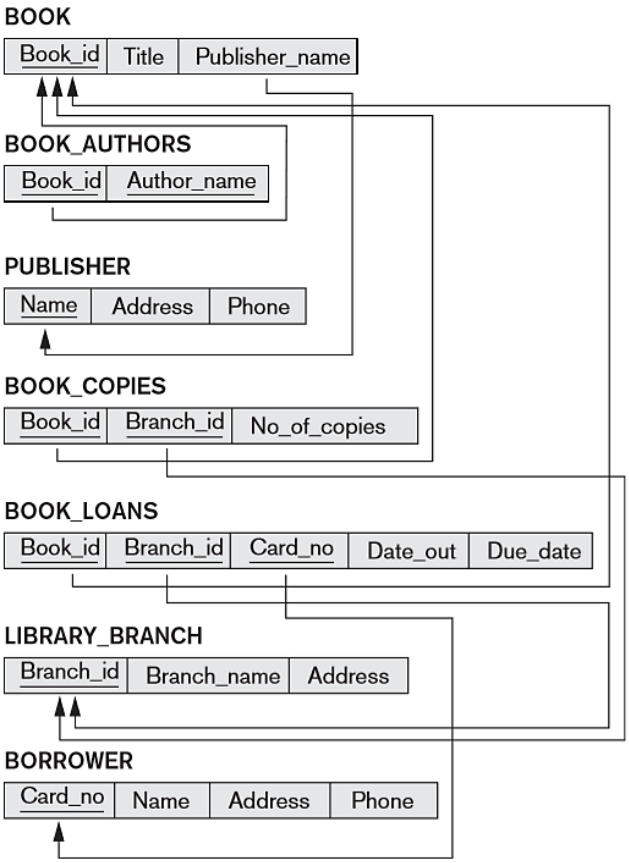
Purpose: The purpose of this tutorial is to provide you with an opportunity to apply relational model principles in practical scenarios. This will improve your ability to identify and remedy errors faced when working with DBMSs.

Learning Outcomes: By the end of this tutorial, you will be able to:

- Identify key aspects of the Relational Model in a database schema
- Understand and identify how integrity constraints are applied when running database operations
- Develop problem solving skills for Relational Model issues in a practical environment

Section A: Recap and Preview

You will review key aspects of the relational model using the example provided below[1].



[1] Questions based on Elmasri & Navathe: Chapter 6: 6.14

A.1 Using the above schema for a LIBRARY database, provide one example for each of the following: **Note**: There may be multiple correct answers for some parts.'

Component	Example
Primary Key	
Foreign Key	
Non-Primary Key Attribute	

Section B: Integrity Constraints

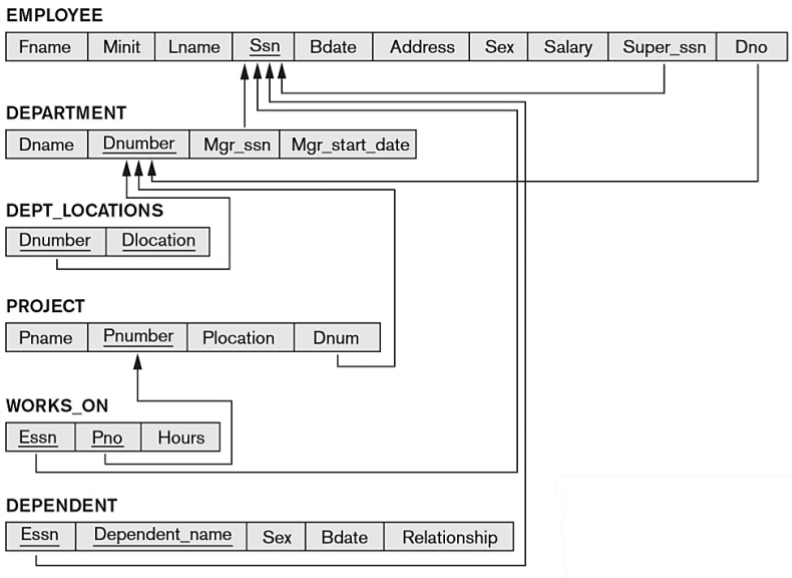
Using the following contextual information, relational diagram and instance data for a company's relational database system[2], you must analyse several database operations and for each operation, identify any integrity constraints that will be violated. Additionally, you must explain how these integrity constraints can be practically enforced by the system. You should consider each operation independently based on the sample data provided. *Do not take into account changes which may have been made by operations from earlier questions.*

Contextual Information:

A company uses a relational database to store and manage employee data and business operations. In addition to the standard DBMS enforced constraints, the Board of Directors has requested that some additional constraints be added to prevent unintentional breaches in company policy. These are as follows:

- An employee's salary cannot be higher than that of their supervisor
- Departments cannot have more than three active projects at a time

Relational Diagram:



[2] Question based on Elmasri & Navathe: Chapter 3: 3.7

Instance Data:

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

(SEE NEXT PAGE FOR QUESTIONS)

B.1 Insert ('Robert', 'F', 'Scott', 943775543, '1942-06-21', '2365 Newcastle Rd, Bellaire, TX', ‘M’, 50000, 888665555, 1) into EMPLOYEE.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs:

B.2 Insert ('ProductA', ‘A’, 'Bellaire', 2) into PROJECT.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs:

B.3 Insert ('Production', 4, 943775543, ‘1988-10-01’) into DEPARTMENT.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs:

B.4 Insert (677678989, null, 40.0) into WORKS_ON.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs:

B.5 Insert ('Grace', 'G', 'Chan', 031203126, '1962-06-21', '2312 Anchor Rd, Bellaire, TX', 'F', 58000, 888665555, 1) into EMPLOYEE.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs:

B.6 Delete the WORKS_ON tuples with ESSN = 333445555.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs:

B.7 Delete the EMPLOYEE tuple with SSN = 987654321.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs:

B.8 Modify the MGRSSN and MGRSTARTDATE of the DEPARTMENT tuple with DNUMBER = 5 to 123456789 and '1988-10-01', respectively.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs:

B.9 Modify the SUPERSSN attribute of the EMPLOYEE tuple with SSN = 999887777 to 943775543.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs:

B.10 Insert ('ProductSuperDuperSecret', 86, 'Washington', 5) into PROJECT.

Will this operation cause an integrity constraint violation? Yes / No

If yes, name the constraint(s) which will be violated and why the violation(s) occurs: