Software Engineering
The University of Auckland

SOFTENG 351 S1 C – Lab 03

Due Date: Sunday 5 April 2020 at 11:59pm

10 marks in total = 1% of the final grade

THE RELATIONAL DATA MODEL AND RELATIONAL DATABASE CONSTRAINTS RELATIONAL DATABASE DESIGN BY ER TO RELATIONAL MAPPING

1. Consider a STUDENT relation in a UNIVERSITY database with the following attributes (Name, SSN, Local_phone, Address, Cell_phone, Age, GPA). Note that the cell phone may be from a different city and state (or province) from the local phone. A possible tuple of the relation is shown below:

Name	SSN	LocalPhone	Address	CellPhone	Age	GPA
George Shaw William Edwards	123-45-6789	555-1234	123 Main St., Anytown, CA 94539	555-4321	19	3.75

a. Identify the critical missing information from the LocalPhone and CellPhone attributes as shown in the example above. (Hint: How do call someone who lives in a different state or province?)
b. Would you store this additional information in the LocalPhone and CellPhone attributes or add new attributes to the schema for STUDENT?
c. Consider the Name attribute. What are the advantages and disadvantages of splitting this field from one attribute into three attributes (first name, middle name, and last name)?
d. What general guideline would you recommend for deciding when to store information in a single attribute and when to split the information?

[2 marks]

2. Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course:

STUDENT (SSN, Name, Major, Bdate)
COURSE (Course#, Quarter, Grade)
ENROLL (SSN, Course#, Quarter, Grade)
BOOK_ADOPTION (Course#, Quarter, Book_ISBN)
TEXT (Book_ISBN, Book_Title, Publisher, Author)

Specify the foreign keys for this schema, stating any assumptions you make.

[2 marks]

3. Suppose each of the following operations is applied directly to the database state shown below. 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

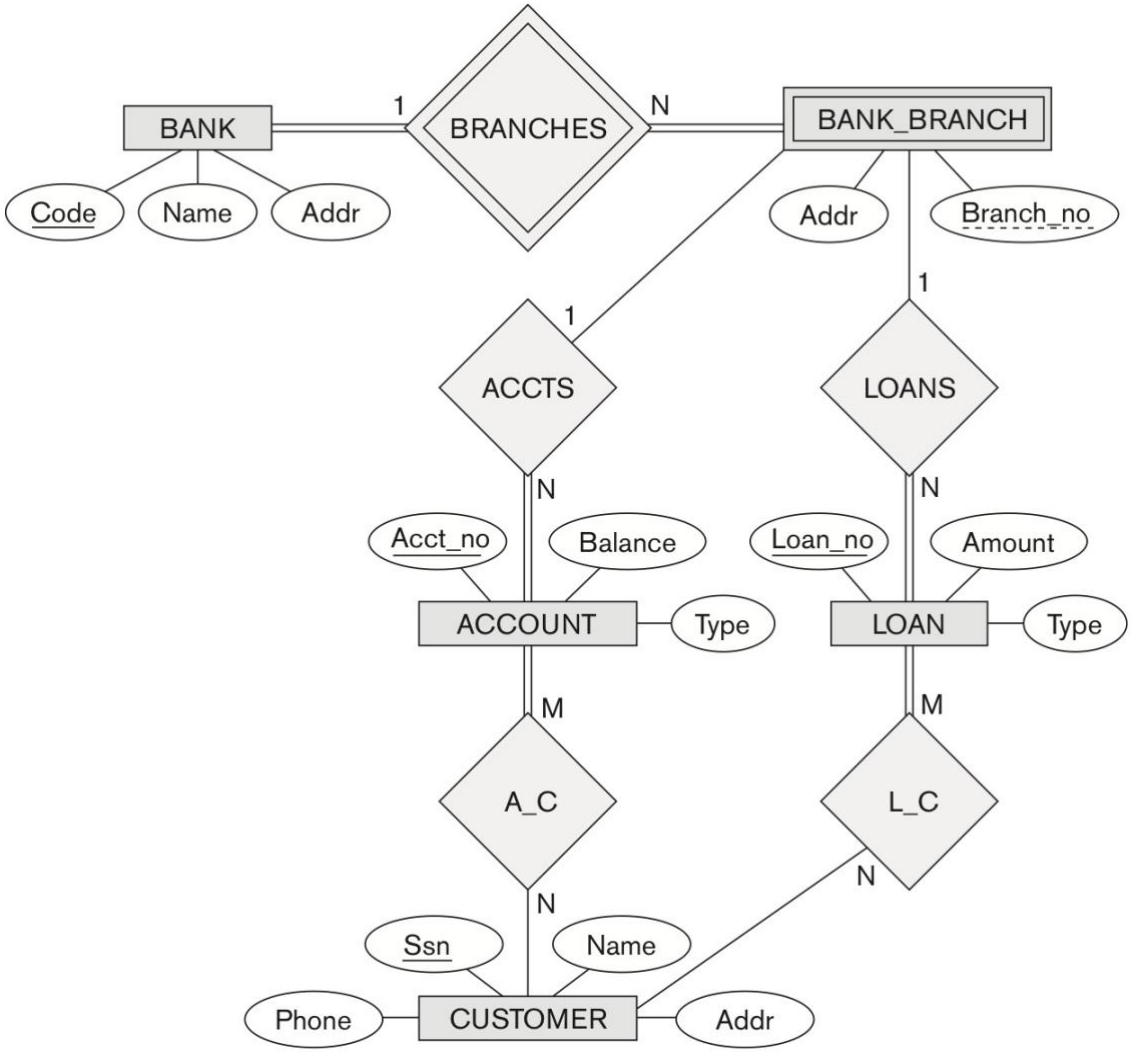
Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123456789	Michael	M	1988-01-04	Son
123456789	Alice	F	1988-12-30	Daughter
123456789	Elizabeth	F	1967-05-05	Spouse

(a) Insert < 'Robert', 'F', 'Scott', '943775543', '21-JUN-42', '2365 Newcastle Rd, Bellaire, TX', M, 58000, '888665555', 1 > into EMPLOYEE.
(b) Insert < 'ProductA', 4, 'Bellaire', 2 > into PROJECT.
(c) Insert < 'Production', 4, '943775543', '01-OCT-88' > into DEPARTMENT.

(d) Insert < '677678989', null, '40.0' > into WORKS_ON.
(e) Insert < '453453453', 'John', M, '12-DEC-60', 'SPOUSE' > into DEPENDENT.
(f) Delete the WORKS_ON tuples with ESSN= '333445555'.
(g) Delete the EMPLOYEE tuple with SSN= '987654321'.
(h) Delete the PROJECT tuple with PNAME= 'ProductX'.
(i) Modify the MGRSSN and MGRSTARTDATE of the DEPARTMENT tuple with DNUMBER=5 to '123456789' and '01-OCT-88', respectively.
(j) Modify the SUPERSSN attribute of the EMPLOYEE tuple with SSN= '999887777' to '943775543'.
(k) Modify the HOURS attribute of the WORKS_ON tuple with ESSN= '999887777' and PNO= 10 to '5.0'.

[3 marks]

4. Map the following BANK ER diagram into a relational database schema (in table representations). Specify all primary keys and foreign keys.



[3 marks]