CS 457 – Data modeling and Implementation Techniques

Homework 3A: (Due: Sep. 25, 2021 at 9 am)

HW 3A problems are from Chapter 3 (E-R modeling) of the 7th edition of Elmasri book

1. Exercise 3.16

Which combinations of attributes have to be unique for each individual SECTION entity in the UNIVERSITY database shown in Figure 3.20 to enforce each of the following miniworld constraints:

1. During a particular semester and year, Every Student have his only one unique ID.
2. During a particular semester and year, Every course use only one code.
3. During a particular semester and year, Every Department have only one code.
4. During a particular semester and year, Every Department have only one admin and only one chairperson.
5. During a particular semester and year, Every College have only one Dean and number of Admins.
6. During a particular semester and year, Every Admin have one Department under his control.
7. Exercise 3.19

Consider the ER diagram in Figure 3.21, which shows a simplified schema for an airline reservations system. Extract from the ER diagram the requirements and constraints that produced this schema. Try to be as precise as possible in your requirements and constraints specification

Requirements=>

1)Airline reservation allows to manage arrival and departure location and time.

2)Flight management allows to manage Flight leg

3)allow user to reserve seat.

4)Repository of Airplane

Constraints=>

1. Airport Consists one Department Airport location, as

well as department time information.

2)and one Arrival Airport location with Arrival time information for each flight.

3)Airport can have only one unique Airport code

4)Each Airplane has Airplane Id and company name which is unique

5)Every Reservation create one Flight leg Instance

6)Each Flight leg have own unique leg number

Exercise 3.22

A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that game, and the result of the game. Design an ER schema diagram for this application, stating any assumptions you make. Choose your favorite sport (e.g., soccer,

baseball, football)

Participate

2 N

Baseball Game

Team

1

M

Player

Has

Play

N N

Exercise 3.24

Consider the ER diagram in Figure 3.23. Assume that an employee may work in up to two departments or may not be assigned to any department. Assume that each department must have one and may have up to three phone numbers. Supply (min, max) constraints on this diagram. State clearly any additional assumptions you make. Under what conditions would the relationship HAS\_PHONE be redundant in this example?

WORKS\_IN

EMPLYEE

DEPARTMENT

N

CONTAINS

(min,max)

HAS\_PHONE

1 N

PHONE

Exercise 3.27

Cardinality ratios often dictate the detailed design of a database. The cardinality ratio depends on the real-world meaning of the entity types involved and is defined by the specific application. For the following binary relationships, suggest cardinality ratios based on the common-sense meaning of the entity types. Clearly state any assumptions you make.

1. STUDENT \_\_\_\_\_\_1:1\_\_\_\_\_\_\_\_ SOCIAL\_SECURITY\_CARD

SSN card number is always unique so the relation is1:1

2. STUDENT \_\_\_\_\_\_1:1\_\_\_\_\_\_\_\_ TEACHER

3. CLASSROOM \_\_\_\_1:4\_\_\_\_\_\_\_\_\_\_ WALL

4. COUNTRY \_\_\_\_\_\_\_1:1\_\_\_\_\_\_\_ CURRENT\_PRESIDENT

5. COURSE \_\_\_\_1:1\_\_\_\_\_\_\_\_\_\_ TEXTBOOK

6. ITEM (that can be found in an order) \_\_\_\_\_\_N:1\_\_\_\_\_\_\_\_ ORDER

In one order, there could be many items.

7. STUDENT \_\_\_\_\_1:N\_\_\_\_\_\_\_\_\_ CLASS

Student can take many classes so the relation is 1:N

8. CLASS \_\_\_\_\_N:1\_\_\_\_\_\_\_\_\_ INSTRUCTOR

One Instructor can teach more than one classes

9. INSTRUCTOR \_\_\_\_\_1:N\_\_\_\_\_\_\_\_\_ OFFICE

Instructor can be in contact with many people.

10. EBAY\_AUCTION\_ITEM \_\_\_\_\_\_\_\_1:N\_\_\_\_\_\_ EBAY\_BID

One auction item can have many BIDs