Name

CWID

Homework Assignment 3

October 29th, 2013

Due on November 12th, 12:30pm (noon)

CS425 - Database Organization

Results

Please leave this empty!

3.1 3.2

Sum

Instructions

- Try to answer all the questions using what you have learned in class
- Some questions are marked as bonus. You do not have to answer these questions to get full points for the assignment. However, you can get bonus points for these questions!

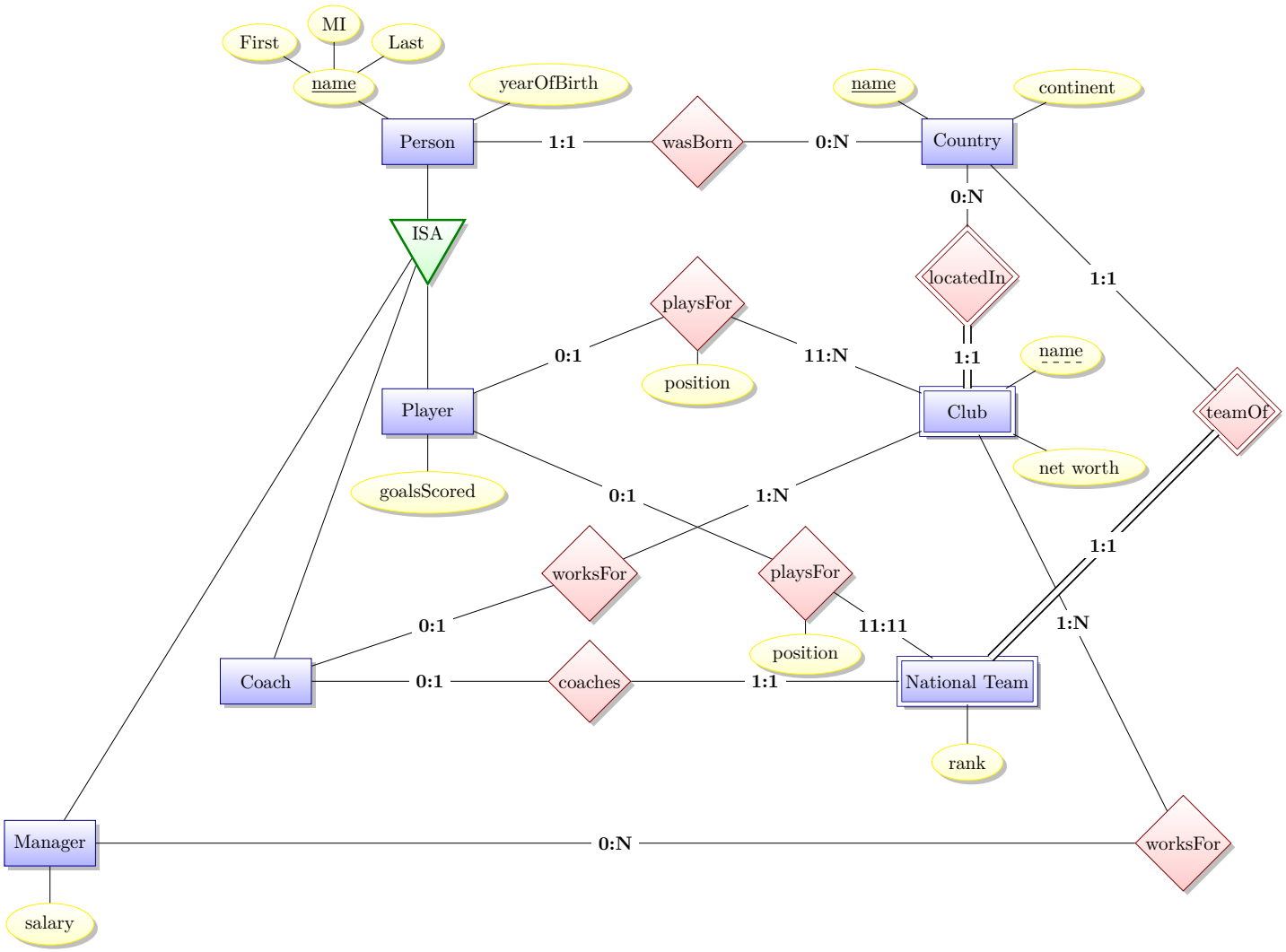
Part 3.1 Modelling (Total: 60 Points)

Question 3.1.1 (7 Points)

Build a conceptional model for a soccer association database. The solution should be presented as an ER-diagram. Base your design on the following requirements.

- The database should record information about persons (players, managers, coaches), clubs, national teams, and countries.
- Countries are uniquely identified by a name. In addition we would like to record which continent a country belongs to.
- Clubs have a name and are located in a country. A country plus the name uniquely identifies a club. Each club has a net worth in dollar. Clubs have 11 or more players, one or more coaches, and at least one manager.
- National teams are uniquely identified by the country they belong too. Each national team consist of 11 players and has one coach. For each national team we record its current numeric rank in the soccer world championship.
- Persons are uniquely identified by their name and and year of birth. Names consists of a first name, middle initial, and last name. For each person we would like to record in which country he/she was born.
- Coaches are persons.
  - A coach can work for at most one club at a time. In addition he/she may be coach of the national team of his/her home country.
- Managers are persons. For each manager we would like to record a salary.
  - A manager can work for several clubs. Each manager works for at least one club.
- Players are persons. For each player we would like to record the number of goal he/she has scored in his/her career.
  - A player plays for a single club. Some players may not play for any club. If a player plays for a club we would like to record in which position (e.g., 'Bob Lansmann plays for Manchester United at position 4').
  - A player may be part of the national team of the country he/she was born in. Again we would like to record the position.

Solution

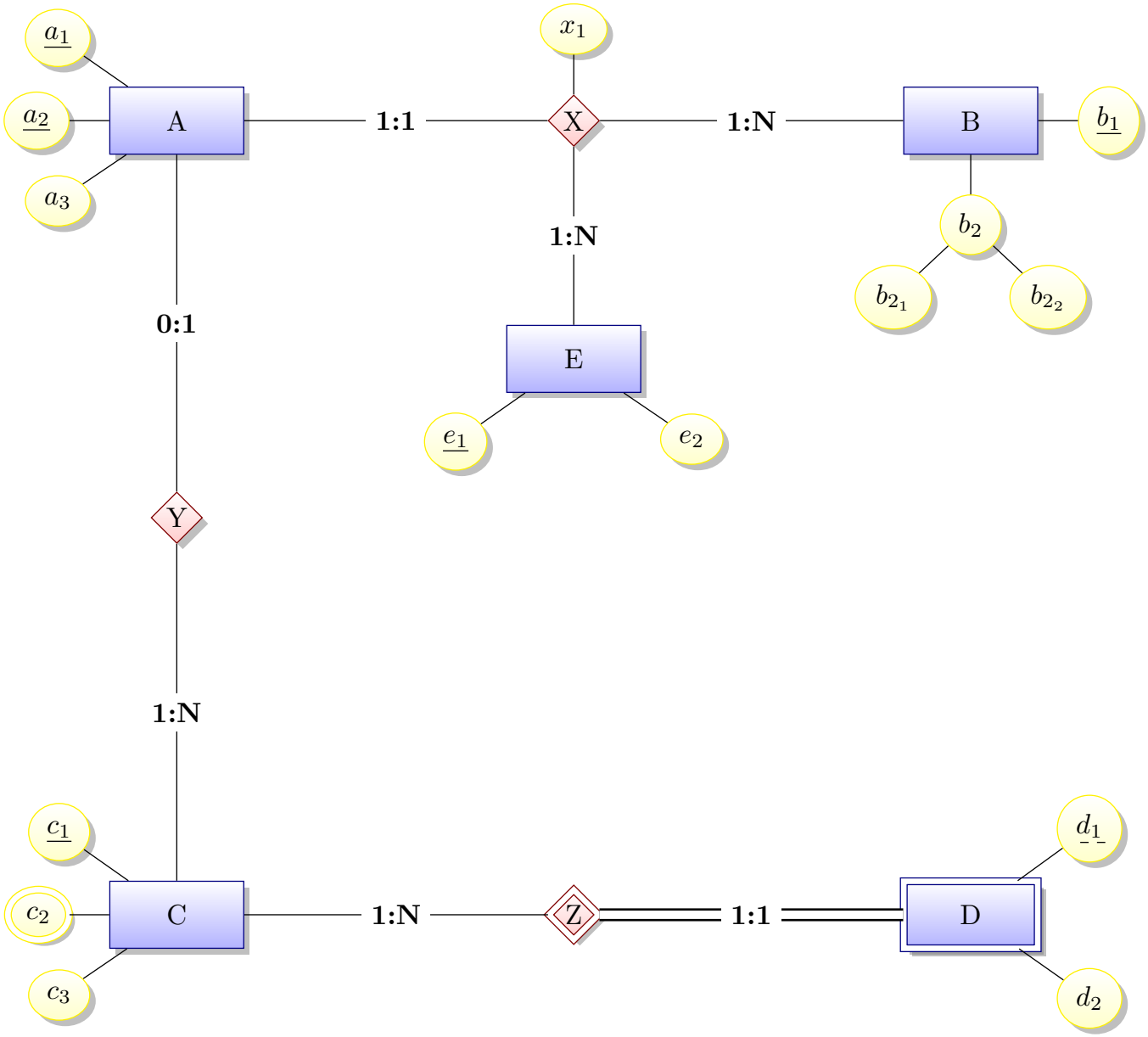

First
MI
Last
name
yearOfBirth
Person
1:1
wasBorn
0:N
name
continent
Country
0:N
locatedIn
1:1
ISA
playsFor
0:1
11:N
position
1:1
name
Player
Club
teamOf
goalsScored
net worth
0:1
1:N
1:1
worksFor
playsFor
0:1
11:11
1:N
position
Coach
0:1
coaches
1:1
National Team
rank
Manager
0:N
worksFor
salary

Part 3.2 Translation of ER into Relational Model (Total: 40 + 10 BONUS Points)

Question 3.2.1 (40 Points)

Take the following ER-model and translate it into a relational schema using the rules presented in class. Present the relational schema as an SQL script (assume that all attributes are of data type `INT`). Present the results of the following intermediate steps in this order:

1. Translate strong entities + unnest composite attributes
2. Translate weak entities
3. Translated multi-valued attributes
4. Translate relationships



Solution

1st Step

```
CREATE TABLE A (
   a1 INT,
   a2 INT,
   a3 INT,
   PRIMARY KEY (a1,a2)
);

CREATE TABLE B (
   b1 INT PRIMARY KEY,
   b21 INT,
   b22 INT
);

CREATE TABLE C (
   c1 INT PRIMARY KEY,
   c3 INT
);

CREATE TABLE E (
   e1 INT PRIMARY KEY,
   e2 INT
);
```

2nd Step

```
CREATE TABLE A (
    a1 INT,
    a2 INT,
    a3 INT,
    PRIMARY KEY (a1,a2)
);

CREATE TABLE B (
    b1 INT PRIMARY KEY,
    b21 INT,
    b22 INT
);

CREATE TABLE C (
    c1 INT PRIMARY KEY,
    c3 INT
);

CREATE TABLE D (
    d1 INT,
    c1 INT REFERENCES C,
    d2 INT,
    PRIMARY KEY(d1,c1)
);

CREATE TABLE E (
    e1 INT PRIMARY KEY,
    e2 INT
);
```

3rd Step

```
CREATE TABLE A (
    a1 INT,
    a2 INT,
    a3 INT,
    PRIMARY KEY (a1,a2)
);

CREATE TABLE B (
    b1 INT PRIMARY KEY,
    b21 INT,
    b22 INT
);

CREATE TABLE C (
    c1 INT PRIMARY KEY,
    c3 INT
);

CREATE TABLE C2 (
    c1 INT REFERENCES C,
    c2 INT,
    PRIMARY KEY (c1,c2)
);

CREATE TABLE D (
    d1 INT,
    c1 INT REFERENCES C,
    d2 INT,
    PRIMARY KEY(d1,c1)
);

CREATE TABLE E (
    e1 INT PRIMARY KEY,
    e2 INT
);
```

4th Step

```
CREATE TABLE B (
   b1 INT PRIMARY KEY,
   b21 INT,
   b22 INT
);

CREATE TABLE C (
   c1 INT PRIMARY KEY,
   c3 INT
);

CREATE TABLE C2 (
   c1 INT REFERENCES C,
   c2 INT,
   PRIMARY KEY (c1,c2)
);

CREATE TABLE A (
   a1 INT,
   a2 INT,
   a3 INT,
   c1 INT REFERENCES C,
   PRIMARY KEY (a1,a2)
);

CREATE TABLE D (
   d1 INT,
   c1 INT REFERENCES C,
   d2 INT,
   PRIMARY KEY(d1,c1)
);

CREATE TABLE E (
   e1 INT PRIMARY KEY,
   e2 INT
);

CREATE TABLE X (
   a1 INT,
   a2 INT,
   e1 INT NOT NULL,
   b1 INT NOT NULL,
   x1 INT,
   PRIMARY KEY (a1,a2),
   FOREIGN KEY (a1,a2) REFERENCES A,
   FOREIGN KEY (b1) REFERENCES B,
   FOREIGN KEY (e1) REFERENCES E
);
```

Alternatively, `X` could be made part of table `A`

Question 3.2.2 (10 (BONUS) Points)

Discuss alternative translations for the relationships, explain why they are valid, and present SQL code to create these alternatives.

Solution

`X` can be made part of table `A`, because it is $1:1$ to `A`.

```
CREATE TABLE A (
   a1 INT,
   a2 INT,
   a3 INT,
   c1 INT REFERENCES C,
   e1 INT NOT NULL,
   b1 INT NOT NULL,
   x1 INT,
   PRIMARY KEY (a1,a2),
   FOREIGN KEY (b1) REFERENCES B,
   FOREIGN KEY (e1) REFERENCES E
);
```

`Y` can be represented as separate table:

```
CREATE TABLE Y (
   a1 INT,
   a2 INT,
   c1 INT NOT NULL,
   PRIMARY KEY (a1,a2,c1),
   FOREIGN KEY (a1,a2) REFERENCES A,
   FOREIGN KEY (c1) REFERENCES C
);
```