

INFO 210, Database Management Systems

Homework 5

Due **Mar. 20st, 2017 Monday**

Description

This assignment covers topics through the course for your preparation of final exam. Other good materials for your final exam reviewing purpose are HW1,2,3,4 and Midterm.

There are **6 parts of questions**, with ONLY simple answers required (e.g. YES/NO).

Submission instructions

Submit your assignment electronically to Bblearn "HW 5" slot(<https://learn.dcollege.net/>).

- Place all parts of your answers into one file, and name it as follows:
INFO210_yourDrexelid_HW5, with the appropriate file extension. For example, INFO210_xyzw98_HW5.docx, INFO210_abc123_HW5.pdf, are valid file names. The file name should not contain any space symbols, and it should contain exactly two underscore symbols.

You may submit multiple times before the due date. .

Remember all the assignments **MUST be completed individually**. You must not discuss or share the assignment answers with your classmates.

Please consult the course syllabus for a description of our plagiarism policy and submit your signed Academic Integrity Statement.

Start doing assignment EARLY as you should.

ONLY answer those in question mark “?” for HW5, and leave others and the explanations for your own practice as well as for your preparation of final exam.

Part 1 (40 points): The relational model

(a) Consider the *create table* statements below.

(a)1. Can A allow null/empty value?

(a)2. Is A unique?

(a)3. Can you set (A, B) as primary key?

**Think about why (*not required to answer the “why” for HW5, but make sure you truly understand for final exam and for yourself.)*

```
create table R (  
  A          number primary key,  
  B          number not null,  
  C          number,  
  D          number,  
  unique (B, C),  
  unique (B, D)  
);
```

(b) Consider now an instance of the relation in (a).

(b)1. Is this a valid instance?

** Think : How would you justify your answer. (*not required to justify)*

A	B	C	D
1	11	5	5
2	22	5	5
3	33	5	5
4	44	5	5
5	55	5	5
6	66	5	5

(c) Consider an instance of relation S below.

Are the following 3 create table statements for relation S

RESPECTIVELY make the instance below a valid instance?

** Think : Why the one that makes it valid instance, and How would you modify the one that makes it invalid (*not required to explain).*

A	B	C
1	11	106
1	22	105
3	33	104
3		103
5	55	102
5	66	101

(c)1.

```
create table R (
  A      number,
  B      number,
  C      number primary key
);
```

(c)2.

```
create table R (
  A      number,
  B      number not null,
  C      number unique
);
```

(c)3.

```
create table R (
  A      number primary key,
  B      number,
  C      number unique
);
```

(c)4.

```
create table R (
  A      number,
  B      number primary key,
  C      number unique not null
);
```

Part 2 (5 points): Entity-relationship modeling

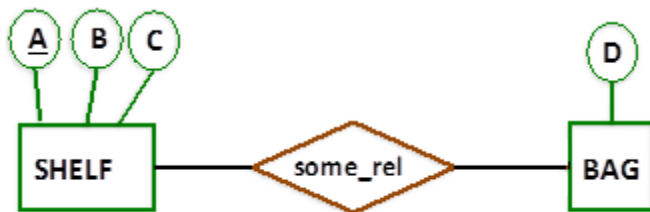
Consider *create table* statements below. You may draw an ER diagram from which these create table statements could have been derived.

Which ER diagram is correct among (a), (b), (c)?

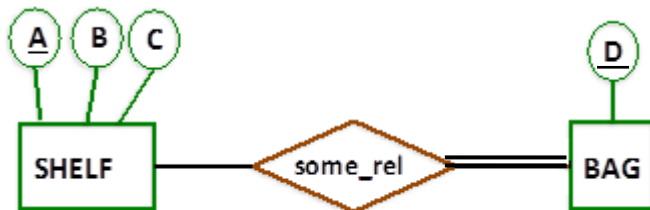
** Think : why a certain diagram is correct or why it is incorrect (*not required to explain why).*

```
create table Shelf (  
  A      number primary key,  
  B      number not null unique,  
  C      number  
);  
  
create table Bag (  
  D      number primary key,  
  A      number not null,  
  foreign key (A) references Shelf(A)  
);
```

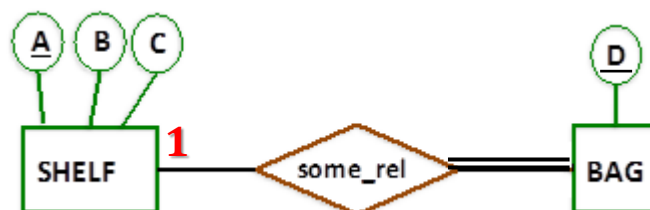
(a).



(b).



(c).



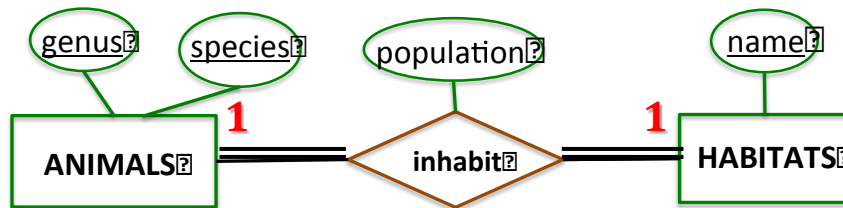
Part 3 (20 points): Translating ER models to relational schemas

Consider ER diagrams below. **Write SQL statements** (*create table*) that implement the constraints specified by the ER diagram below. Create as many tables as required. **Briefly explain** which constraints (**key** or/and **participation** constraint) are captured in your relational implementation, and in what way. If a constraint cannot be implemented, state that explicitly in your explanation. You will not receive full credit without an explanation. (Attribute *population* refers to the number of animas in a habitat.)

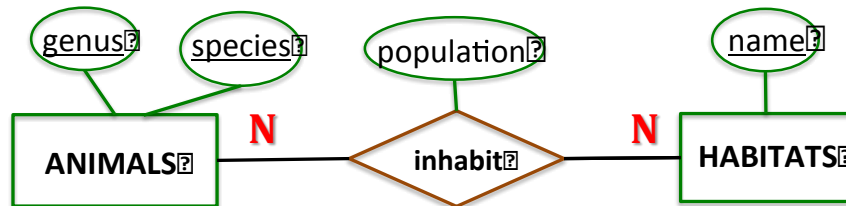
ONLY answer (a) in details, what's your SQL statement?

* Think : (b), (c), (d) for your own practice (*not required to answer (b), (c), (d)).

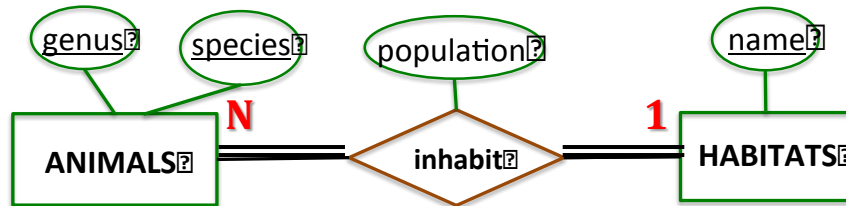
(a)



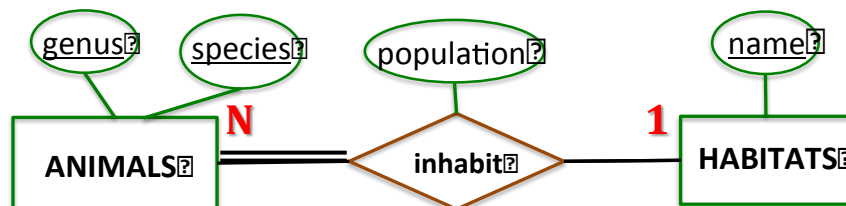
(b)



(c)



(d)



Part 4 (15 points): Relational algebra

Authors (first, last, country, born)

Books (title, author, year)

Nobel_Winners (author, year)

Authors

first	last	country	born
Haruki	Murakami	Japan	1949
Kindzaburo	Oe	Japan	1935
Yasunari	Kawabata	Japan	1899
Yukio	Mishima	Japan	1925
Ivo	Andric	Yugoslavia	1892
Mesa	Selimovic	Yugoslavia	1910
Danilo	Kis	Yugoslavia	1935
Julio	Cortazar	Argentina	1914
Mario	Vargas Llosa	Peru	1936
Jorge	Borges	Argentina	1899
Gabriel Garcia	Marquez	Colombia	1927

Books

title	author	year
Captain Pantoja and the Special Service	Vargas Llosa	1978
The City and the Dogs	Vargas Llosa	1963
Confessions of a Mask	Mishima	1949
Patriotism	Mishima	1961
Acts of Worship	Mishima	1965
The Bridge on the Drina	Andric	1945
The Damned Yard	Andric	<i>null</i>
Death and the Dervish	Selimovic	1966
Axolotl	Cortazar	<i>null</i>
The Library of Babel	Borges	1941
Labyrinths	Borges	<i>null</i>

Nobel_Winners

author	year
Andric	1961
Kawabata	1968
Vargas Llosa	2010
Marquez	1982
Oe	1994

Consider relation instances of `Authors`, `Books`, `Nobel_Winners`, with the given schemas. In each question below, **write a relational algebra expression for each of the (a),(b),(c) and show its result** when the expression is executed with the given instances. **What is your expressions and results?**

ONLY answer (a) in details, what's your expression and result of relational algebra?

* Think : (b), (c) for your own practice (*not required to answer (b), (c)).

(a) List first and last names of authors from countries other than Japan.

(b) List titles and publication years of books written by authors from Yugoslavia.

(c) List first and last names of Nobel Prize winners, and titles of the books that they wrote.

Part 5 (15 points): SQL

Consider relation instances of `Authors`, `Books`, `Nobel_Winners`, with the given schemas. In **each** question below, **answer if the SQL query and its result showed is correct or not ?**

Answer (a),(b),(c) with simple "correct/not correct" ?

* Think : why a certain sql query and result is correct or why it is incorrect (*not required to explain why).

(a) Compute the number of Nobel Prize winner by country, for counties in which we have information about Nobel Prize winners. Sort the results by the number of winners, from higher to lower.

```
select A.country, count(*) as num_winners
from   Authors A, Nobel_Winners N
where  A.last = N.author
group by A.country
order by num_winners desc
```

country	num_winners
Japan	2
Colombia	1
Peru	1
Yugoslavia	1

(b) List names of countries from which at least 2 authors won the Nobel Prize. Order results by the number of Nobel Prize winners, higher to lower, breaking ties by country name, (alphabetically) lower to higher.

```
select A.country, count(*) as num_winners
from   Authors A, Nobel_Winners N
where  A.last = N.author
group by A.country
having count(*) >= 2
order by num_winners desc, A.country
```

country	num_winners
Japan	2

(c) List book titles by an author whose first name is Mario.

```
select title
from   Books
where  author in (
      select last
      from   Authors
      where  first = 'Mario')
```

title
Captain Pantoja and the Special Service
The City and the Dogs

Part 6 (5 points): Normalization

Which Normal Form is the below relation satisfied? (**Only** answer it is 1NF or 2NF or 3NF or BCNF)

** Think : How would you decompose it to achieve higher NF? (*not required to answer)*

courseNo	title	sectionNo	instructorID	fName	lName
ACCT101	Accounting I	1	44	Jennifer	Furman
ACCT101	Accounting I	2	44	Jennifer	Furman
ACCT102	Accounting II	1	44	Jennifer	Furman
MATH105	Algebra	1	76	Andy	Chou