BIRZEIT UNIVERSITY

COMP333-Database Systems

Date: Tuesday 24/11/2015 **Midterm Exam - Fall 2015/2016** **Time: 90 minutes**

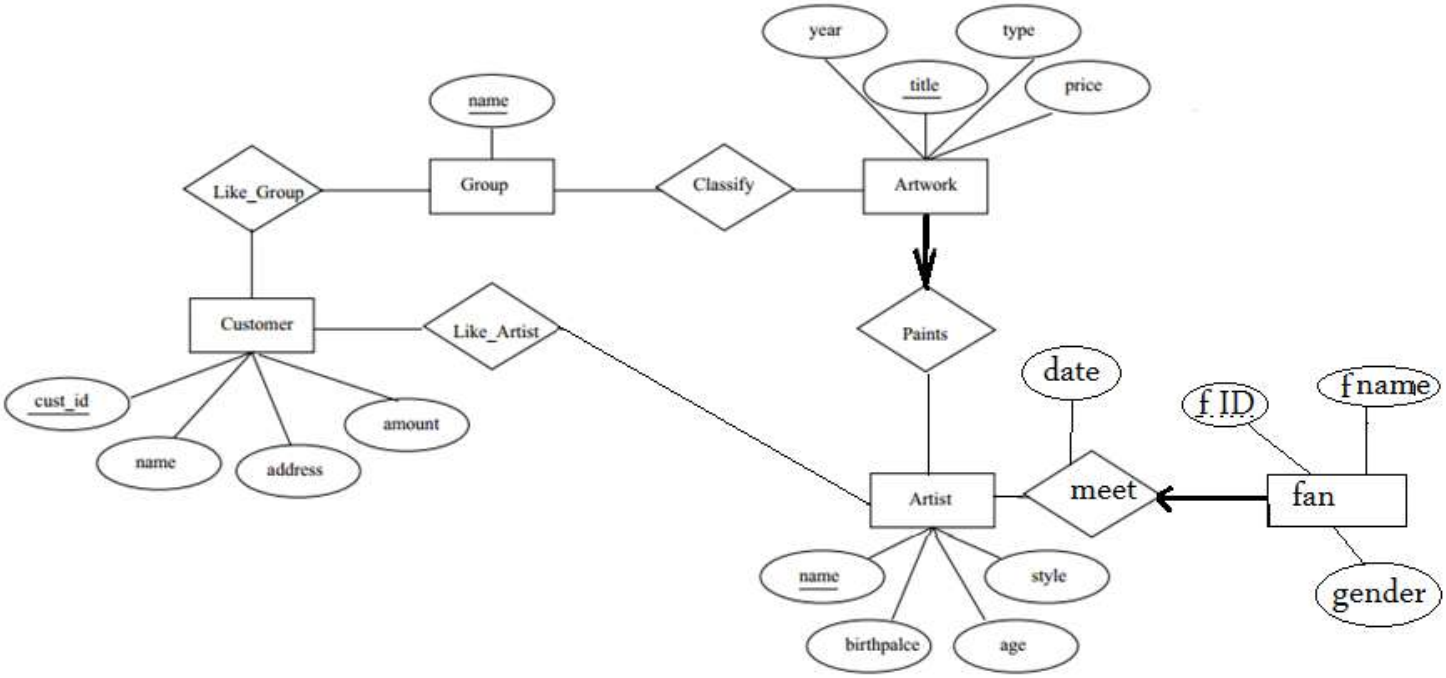
Student Name: **Student ID:**

Instructor: ☐ Mr. Wahbeh Mousa ☐ Dr. Ahmad Abusnaina

Question #1: [25 points]

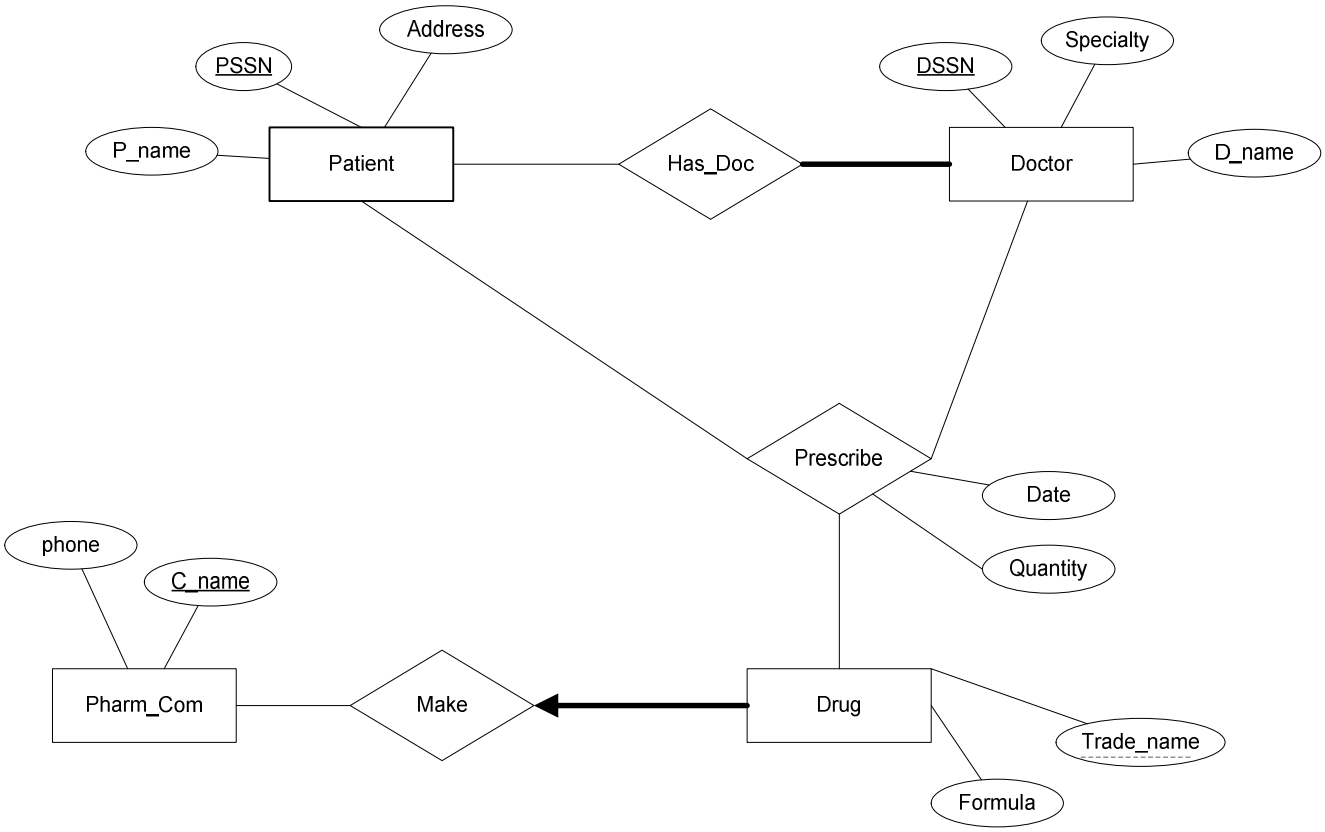
The Association of Arts asked you to build a computerized system to keep track about the artists, their works, fans and customers. You decided to do this business using the concepts of database, you named it *ArtBase*. So, the core of *ArtBase* is a database with a schema that captures all the information the association needs to maintain. **Draw the ER diagram for the *ArtBase*.** Here the information you gather:

- Every artist is identified by his/her ID, name, birthplace, and style of art.
- For each piece of artwork the artist performed, the year it was performed, its unique title, its type of art (e.g. painting, lithograph, sculpture, photograph), and its price must be stored. We know that every artwork is performed by only one artist.
- Pieces of artwork are also classified into groups of various kinds (e.g. Portraits, works by Picasso, or works of the 19th century); a given piece of artwork may belong to more than one group.
- Each group is identified by a name that describes the group.
- The artist has fans. So, the fans can meet with their artist. The date of meeting is to be recorded. Before meeting, each fan should be registered in *ArtBase* by his/her unique ID, name, and gender. Assume that once the artist is retired (or deleted), you do not need to keep track any of his/her fans any longer.
- Finally, *ArtBase* keeps information about the customers. The customer has ID, name, address, total amount of dollars spent. The customer can like many artists, and can like a single group of artwork.


year
type
title
price
name
Like_Group
Group
Classify
Artwork
Customer
Like_Artist
Paints
date
f_ID
fname
cust_id
amount
name
address
Artist
meet
fan
name
style
gender
birthpalce
age

Question #2: [35 points]

I-Translate the following ER diagram into a relational schema using the create SQL statements. [25 points]




```
CREATE  TABLE  Patient ( pssn CHAR(11),
                         p_name CHAR(20),
                         address CHAR(20),
                         PRIMARY KEY (pssn))

CREATE  TABLE  Doctor_Has ( dssn CHAR(11),
                            d_name CHAR(20),
                            specialty CHAR(20),
                            pssn CHAR(20) NOT NULL,
                            PRIMARY KEY (dssn)
                            FOREIGN KEY (pssn) REFERENCES Patient)

CREATE  TABLE  Make_Drug (trade name CHAR(20),
                          formula CHAR(30),
                          c_name CHAR(11),
                          PRIMARY KEY (trade name, c_name),
                          FOREIGN KEY (c_name) REFERENCES
                          Pharm_Com ON DELETE CASCADE)
```

```
CREATE  TABLE  Prescribe ( pssn CHAR(11),
                           dssn CHAR(11),
                           date CHAR(11),
                           quantity INTEGER,
                           trade name CHAR(20),
                           c_name CHAR(11),
                          PRIMARY KEY (pssn, dssn),
                          FOREIGN KEY (pssn) REFERENCES Patient,
                          FOREIGN KEY (dssn) REFERENCES Doctor_Has,
                          FOREIGN KEY (trade name, c_name)
                          REFERENCES Make_Drug)


CREATE  TABLE  Pharm_Com (c_name CHAR(20),
                          phone CHAR(20),
                          PRIMARY KEY (c_name))
```

II- Use appropriate SQL commands to perform the following actions on the database. [10 points]

- Add the following person to table patient: pssn=222333, name= ABC, address=Palestine.

```
INSERT
INTO Patient (pssn, name, address)
VALUES (222333, 'ABC', 'Palestine')
```

- Delete the doctor whose DSSN is 555.

```
DELETE
FROM Doctor_Has  D
WHERE D.dssn = 555
```

- Change the phone number of ‘DarElshefa’ company from 333222 to 888999.

```
UPDATE Pharm_Com  C
SET C.phone = 888999
WHERE   C. c_name =  ‘DarElshefa’
```

Question #3: [25 points]

Write the following queries in **SQL** by considering the following relational schema. An employee can work in more than one department. The *pct_time* field of the Works relation shows the percentage of time that a given employee works in a given department. The *managerid* field in Dept is foreign key refers to *eid* from Emp.

Emp(*eid:* integer, *ename:* string, *age:* integer, *salary:* real)
Works(*eid:* integer, *did:* integer, *pct_time:* integer)
Dept(*did:* integer, *dname:* string, *budget:* real, *managerid:* integer)

1. Find the names and ages of each employee who works in both the 'Hardware' department and the 'Software' department.

```
SELECT  E.ename, E.age
FROM    Emp E, Works W1, Works W2, Dept D1, Dept D2
WHERE  E.eid = W1.eid AND W1.did = D1.did AND D1.dname = 'Hardware' AND
          E.eid = W2.eid AND W2.did = D2.did AND D2.dname = 'Software'
```

2. Find the names of employee whose salary exceeds the budget of all of the departments that he or she works in.

```
SELECT E.ename
FROM Emp E
WHERE E.salary > ALL (SELECT D.budget
                      FROM Dept D, Works W
                      WHERE E.eid = W.eid AND D.did = W.did)
```

3. Find the *enames* of managers who manage the departments with the largest budgets.

```
SELECT E.ename
FROM    Emp E
WHERE E.eid IN (SELECT D.managerid
                FROM Dept D
                WHERE D.budget = (SELECT MAX (D2.budget)
                                  FROM Dept D2))
```

4. Find the names of employees who are older than the oldest employee with a salary greater than 200.

```
SELECT E.ename
FROM Emp E
WHERE E.age > (SELECT MAX(E2.age)
               FROM Emp E2
               WHERE E2.salary =200)
```

5. Find the average age of employees who are at least 25 years for each department name.

```
SELECT   D.name, AVG(E.age) AS avgage
FROM Emp E, Dept D, Works W
WHERE E.age>=25 AND E.eid = W.eid AND D.did = W.did
GROUP BY D.dname
```

Question #4: [15 points]

By considering the following schema, write the following queries in Relational Algebra

Sailors(sid, sname, age, rating)
Boats(bid, bname, color, size)
Reserves(sid, bid, day)

a) Find the sailor names whose age is 25.

$$\pi_{sname}\left(\sigma_{age=25}(sailors)\right)$$

b) Find the colors of boats reserved by 'Osama'.

$$\rho\left(T, Reserves \bowtie \sigma_{sname='Osama'}(sailors)\right)$$
$$\pi_{color}(T \bowtie Boats)$$

c) Find the names boats that were not reserved by any sailor.

$$\pi_{Boats.bname}\left(\pi_{bid,bname}(Boats) - \pi_{Reserves.bid,Boats.bname}(Reserves \bowtie Boats)\right)$$

where S.city LIKE '%R' AND
S.major = 'COMP'

2. Find the names of all students who received an "A" in course 'COMP333' in the semester of Fall 2009.

Select S.name
from Taking T, Student S, Semester E, classC
where T.student_id = S.student_id AND
~~T.semester = E.semester~~ T.sem_id = E.sem_id AND
T.cource_id = C.course_id AND
C.course_level = 'COMP333' AND
T.grade = 'A' AND E.~~season~~ = Fall,
AND
E.year = '2009'

3. Find the names of all faculty who taught at least one class.

select F.name, count(C.cource-id)
from Faculty F, Class C, Teaching T
where F.ssn = T.ssn AND
T.course_id = C.course_id AND
count(cource_id) > 1

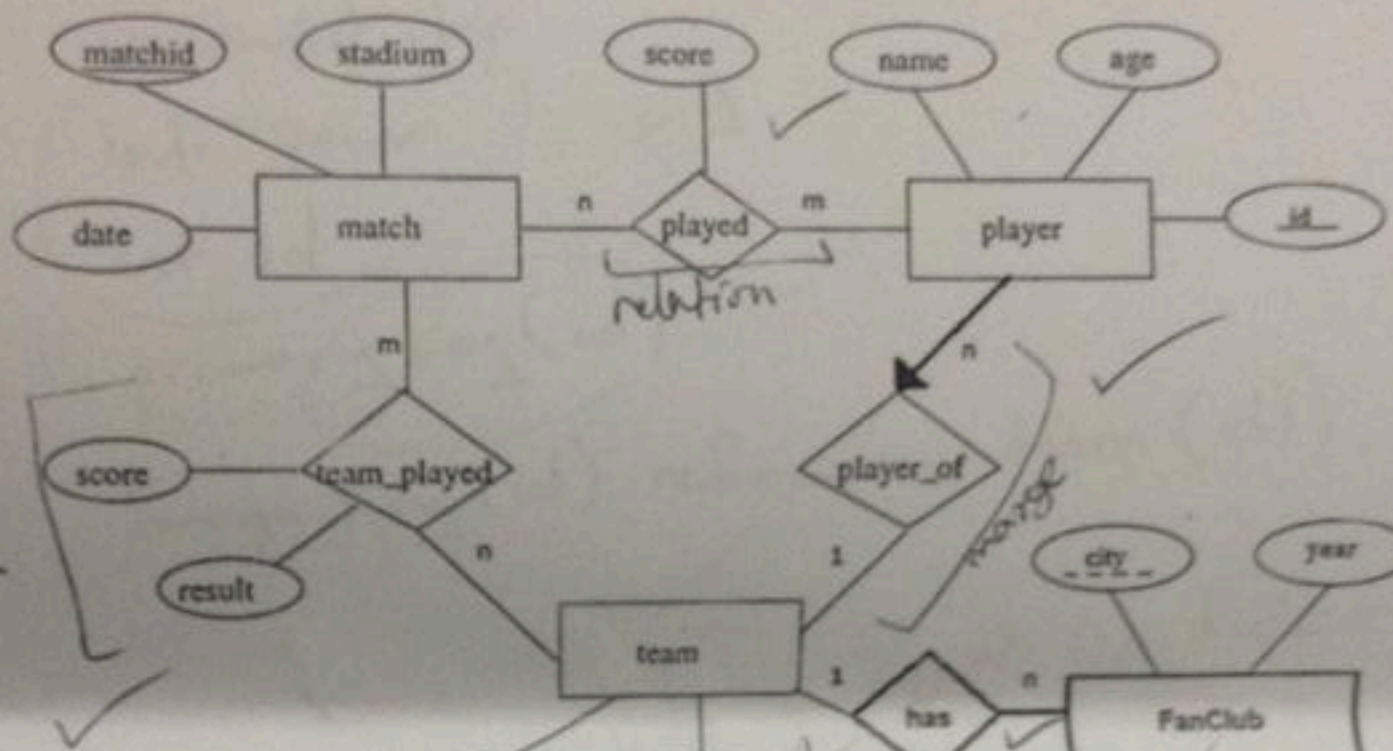
-3

Question # 2 (25 points) :

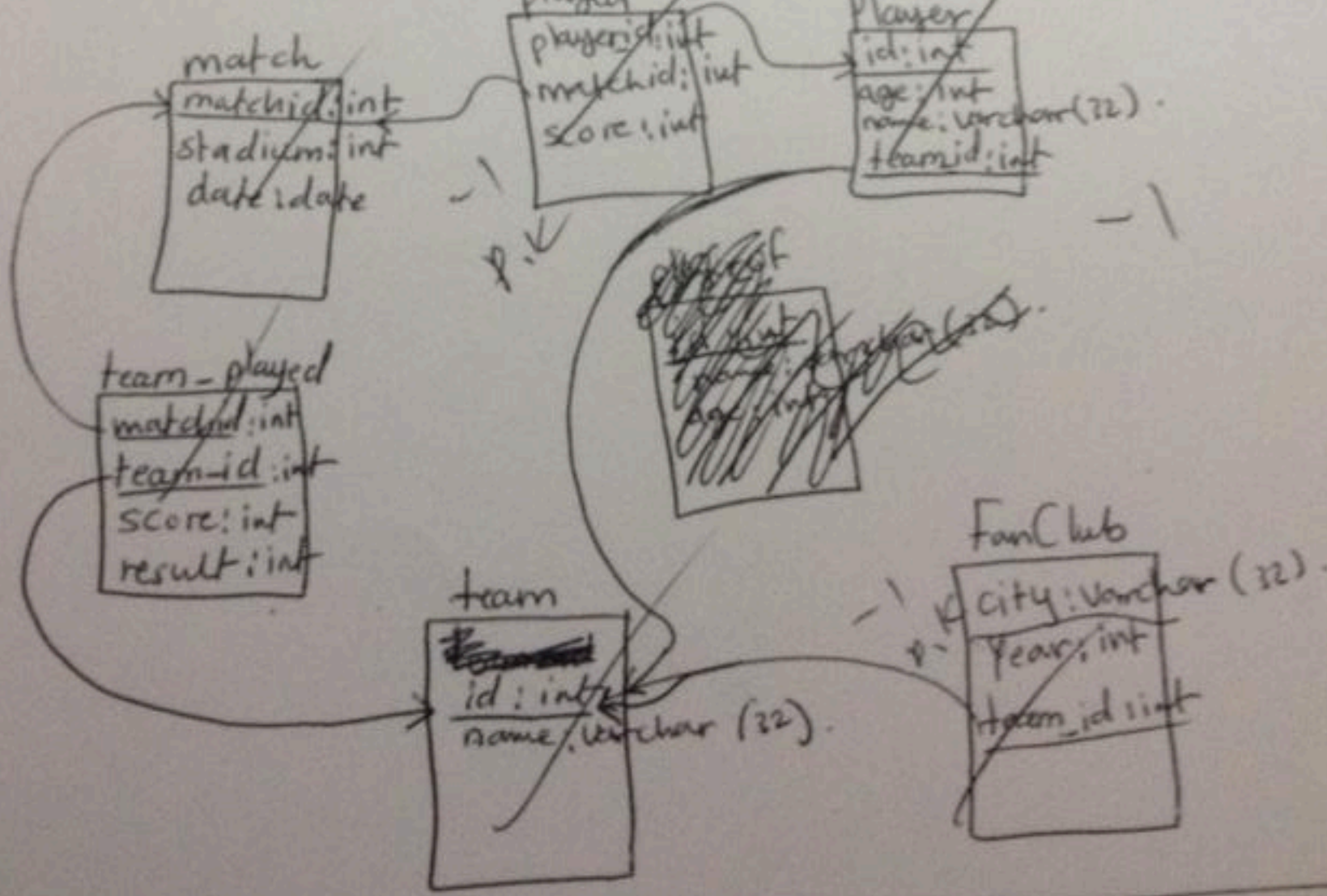
Translate the following ER diagram about football teams and matches into relational schema.

a) Design a relational schema for the following ER diagram. Be sure to highlight all primary keys and foreign keys. For foreign keys, indicate which relations/columns they are referencing, also indicate which columns are "on delete cascade constraints".

b) Write SQL Create table statements for the Entitiy-Relationships: team-has-fanClub.



a)



Question # 4 (35 points) :

Consider the following university schema:

- **Student**(student_id, name, phone, major, city)
- **Faculty**(ssn, name, rank)
- **Class**(course_id, title, sem_id, course_level)
- **Taking**(student_id, course_id, sem_id, grade)
- **Teaching**(ssn , course_id, sem_id)
- **Semester**(sem_id, year, season)

Note:

- Course_level takes 4 values: first_year, second_year, third_year or fourth_year
- Season takes three values: Fall, Spring or Summer
- Grade takes letter values: 'A', 'B', etc…
- Current semester is Fall 2013.

Answer the following queries in SQL.

1. Find the names of all students from city that begins with 'R' and who are COMP majors.

```
select S.name
from Student S
where S.city LIKE "%R" AND
      S.major = 'COMP'
```

"A" in course 'COMP333' in the semester of F

4. Find the names of all faculty who is teaching at least one class this semester.

Select F.name, count(C.cource-id)
from Faculty F, Teaching T, Semester S, Class C
where F.SSN = T.SSN AND
T.sem_id = S.sem_id AND
T.cource_id = C.cource_id AND
count(C.cource_id) > 1 AND
S.season = 'Fall' AND S.year = '2013'.

5. Find the names of faculty who never taught any classes.

Select F.name
From Faculty F, ~~Teaching T, Class C~~
where F.SSN NOT IN (Select T.SSN
from Teaching T
where T.cource_id (select C.cource_id
from Class C))

student. Print the student id and the number of courses the student has taken in which he has

C.cource-id

from Teaching T IN
where T.cource_id (select C.cource_id
from Class C)

6. For each student, Print the student id and the number of courses the student has taken in which he has received A for those courses.

Select ~~[illegible]~~ S.student_id, C.cource_id
from Student S, Class C, Taking K
where S.student_id = K.student_id AND
C.cource-id = K.cource_id AND
K.grade = 'A'
group by (S.student_id)

7. Print the names of the faculty who taught a first year course and a second year course in the same semester.

Select f.name
from Faculty f, Class C, Semester S, Teaching T
where f.ssn = T.ssn AND
T.sem-id = S.sem-id AND
T.cource-id = C.cource-id AND
C.cource_level = 'first year'
AND
C.cource-level = 'second year'

-5

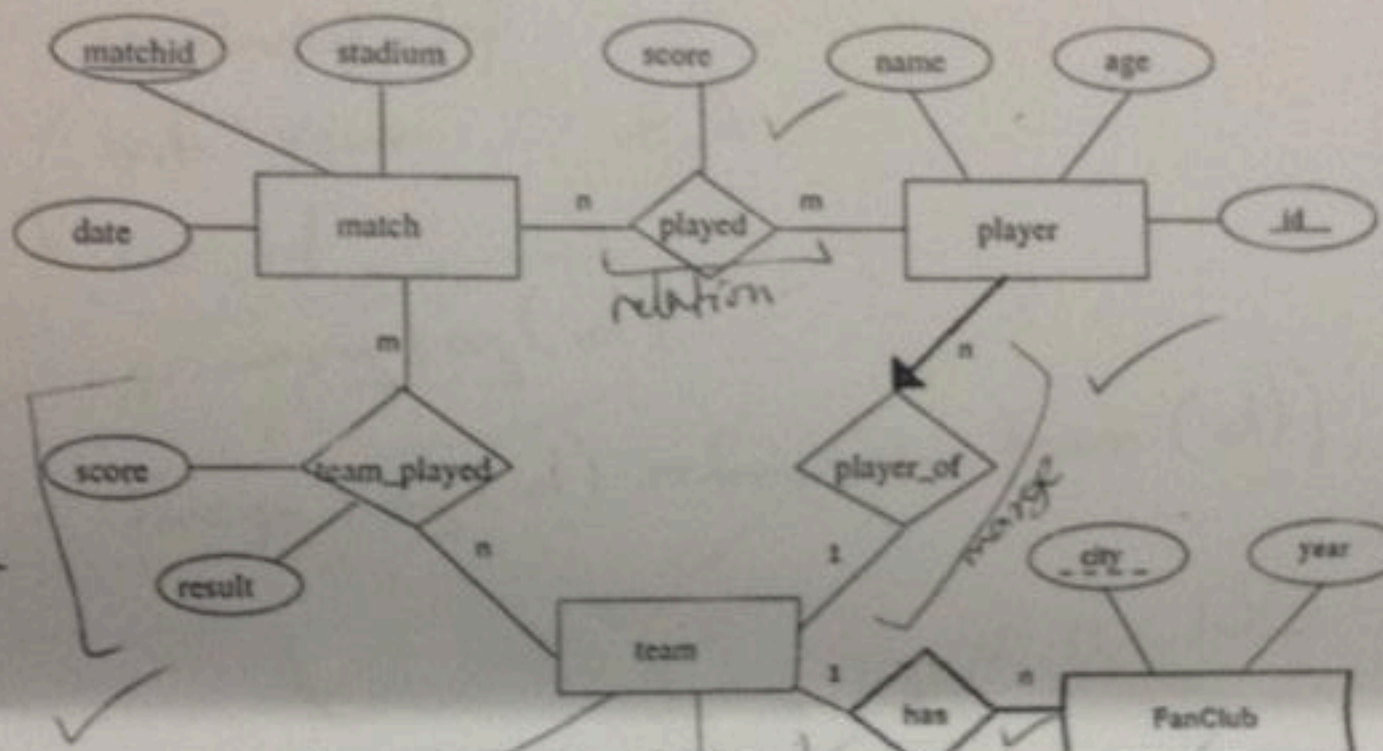
End of Exam – Best Wishes

Question # 2 (25 points) :

Translate the following ER diagram about football teams and matches into relational schema.

a) Design a relational schema for the following ER diagram. Be sure to highlight all primary keys and foreign keys. For foreign keys, indicate which relations/columns they are referencing, also indicate which columns are "on delete cascade constraints".

b) Write SQL Create table statements for the Entitiy-Relationships: team-has-fanClub.



a)

match
matchid: int
stadium: int
date: date

played
playerid: int
matchid: int
score: int

player
id: int
age: int
name: varchar(32)
teamid: int

team_played
matchid: int
teamid: int
score: int
result: int

team
id: int
name: varchar(32)

FanClub
city: varchar(32)
year: int
teamid: int

- Season takes the
- Grade takes letter values: 'A', 'B', etc...
- Current semester is Fall 2013.

Answer the following queries in SQL.

1. Find the names of all students from city that begins with 'R' and who are COMP majors.

```
select S.name
from Student S
where S.city LIKE "%R" AND
      S.major = 'COMP'
```

2. Find the names of all students who received an "A" in course 'COMP333' in the semester of Fall 2009.

```
Select S.name
from Taking T, Student S, Semester E, classC
where T.student_id = S.student_id AND
      T.sem_id = E.sem_id AND
      T.courseid = C.course_id AND
      C.course_level = 'COMP333' AND
      T.grade = 'A' AND E.season = 'Fall'
      AND
      E.year = '2009'
```

3. Find the names of all faculty who taught at least one class.

```
select F.name, count((C.cource-id))
from Faculty F, Class C, Teaching T
where F.ssn = T.ssn AND
      T.course_id = C.course_id AND
      ...id)) > 1
```

Question # 3 (15 points)

Consider the following schema

Sailors(sid, sname, age, rating)
Boats(bid, bname, color, size)
Reserves(sid, bid, day)

Answer the following queries in Relational Algebra

a) Find the sailor names whose rating is 9.
b) Find the colors of boats reserved by 'John'.
c) Find the names boats who were not reserved by any sailor.

a) $\Pi_{S.sname}(\sigma_{S.rating=9}(Sailors))$.

b)

c)

جامعة بيرزيت
BIRZEIT UNIVERSITY

Faculty of Information Technology
Computer Science Department
Database Systems - COMP333

Midterm Exam

Date: Sunday, 22/12/2013
Time: 90 minutes

Please choose your instructor:
☑ **Bassem S Sayrafi** ☐ **Ibrahim M Srahin**

Student Number:	1111824
Student Name:	Aya Eid

Instructions:

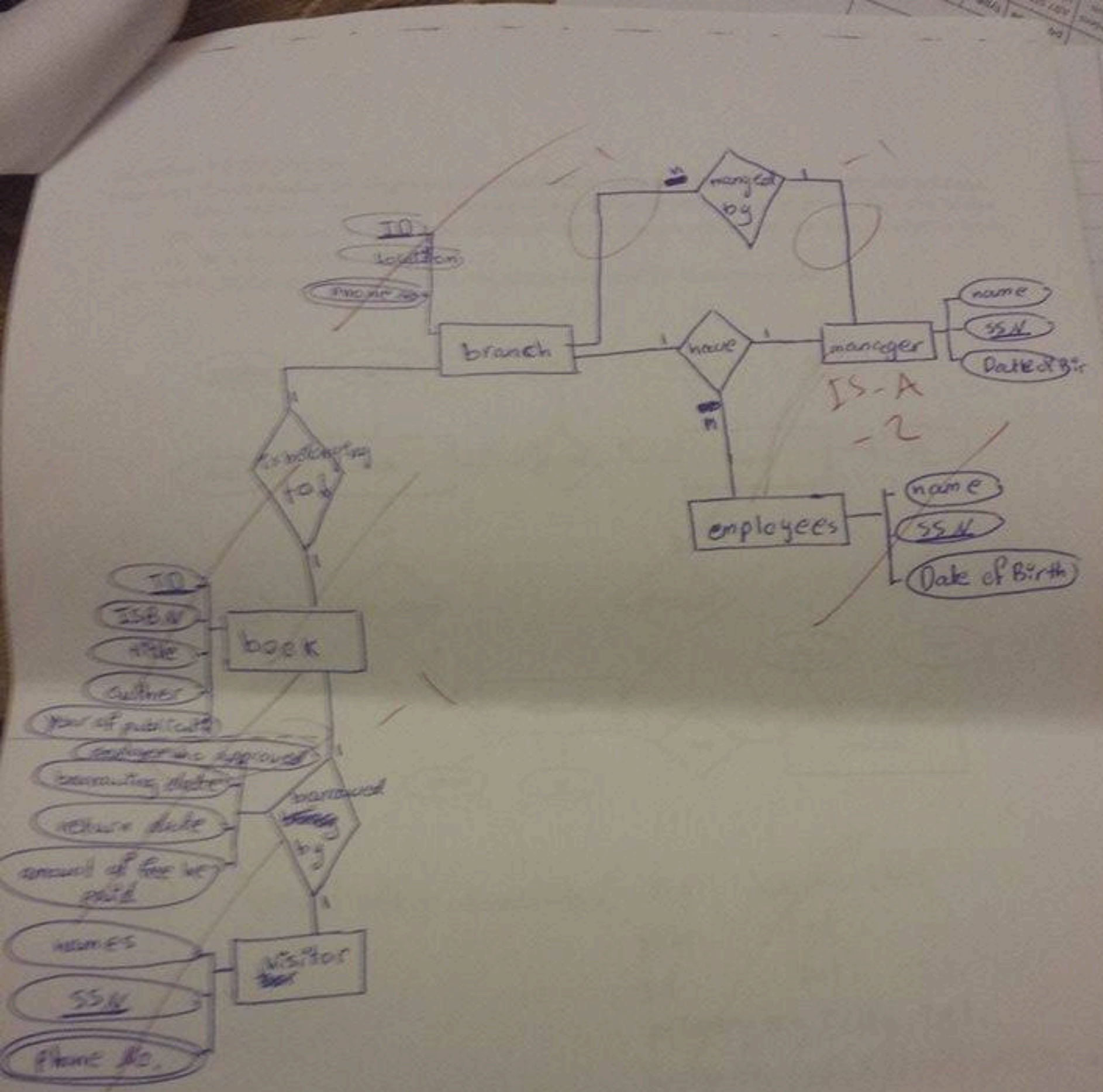
- ✓ This is a closed book exam. Answer all of the four questions, no optional questions.
- ✓ Students' questions are allowed only in the first 15 minutes after distribution the exam papers.
- ✓ Leaving the exam not before half the exam time being passed.

Question #	1	2	3	4	Total of 100
Grade	22	19	13	24	78

Question # 1 (25 points) :

Consider the following description about a public library with multiple branches across different locations in the country. ER: Daigrame

- Each branch of the library has a branch ID , location and one or many phone numbers. ✓
- Each branch must have exactly only one manager and other employees which we want to record their names, SSN and Date of Birth.
- The manager must manages at least one library branch.
- Each book has ID, ISBN number, title ,author and year of publication. The book is belonging to one of the library branch.
- When a library's visitor barrow a book ; we want to track barrowing date, return date, amount of fees he paid and the employee who approves this barrowing process.
- Also we want to record the visitors information like names, SSN and phone number(s).


manage by
ID
location
branch
have
manager
name
SSN
Date of Birth
IS-A
-2
employees
name
SSN
Date of Birth
book
ID
ISBN
Title
Author
borrowed by
Visitor
SSN
Phone No.

Q4)@

$\Pi_{borrower.Name}$ ($\sigma_{Book.title=SQL}$ Book ⋈ (Borrower ⋈ Borrow-Book))

Q2) Consider the following table *Accounts*:(25 points)

AccNum	AccName	City	Balance
1	A	Nablus	900
2	B	Ramallah	200
3	C	Jerusalem	800
4	D	Nablus	400
5	E	Hebron	300
6	F	Hebron	900
7	G	Ramallah	300
8	H	Nablus	560
9	I	Jerusalem	700
10	G	Ramallah	250
11	H	Gaza	300

Show the output of the following statements:

a) Select sum(balance) as x from Accounts group by city;

```
Select sum (balance)
From Accounts
group by city
```

city	Balance
Nablus	1860
Ramallah	750
Jerusalem	1500
Hebron	1200
Gaza	300

x
1860
750
1500
1200
300

b) Select * from Accounts Where city like '%m' or balance>800;

Acc Num	Acc Name	city	Balance
1	A	Nablus	900
2	B	Ramallah	200
3	C	Jerusalem	800
6	F	Hebron	900
9	I	Jerusalem	700

c) Select * from Accounts where city like '%al%' ;

Acc Num	Acc Name	city
2	B	Ramallah
7	G	Ramallah

d) Select * from Accounts as A where A.balance between 400 and 700 order by city;

Nablus
Jerusalem

Acc Num Acc

25

Q2

(b)

Acc No	Acc Name	city	Balance
1	A	Nablus	900
3	C	Jerusalem	800
6	F	Hebron	900
9	I	Jerusalem	700

(c)

Acc no	Acc Name	city	Balance
2	B	Ramallah	200
3	C	Jerusalem	800
7	G	Ramallah	300
9	I	Jerusalem	700
10	G	Ramallah	250

(d)

Acc no	Acc Name	city	Balance
4	D	Nablus	400
8	H	Nablus	560
9	I	Jerusalem	700

How many copies of book titled "Database" are owned by the library branch whose name is "Al-Aqsa".

or no of copies

```
Select  (Count (*)) as XX
From    Book B, copies c, library L
where   Book.titled = "Data Base"
AND L Brnx = "Al-Aqsa"
AND B.ID = c.ID
AND L Brnc.ID = c.BrncID.
```

-2

c) How many copies of book titled "Database" are owned by each library branch.

-2

```
Select  Book.titled
        Count (*)
From    Book B, copies c, Library L
where   Book.titled = "Data Base"
~~group by Book.titled~~
        AND B.ID = c.ID
        AND L.Brnc.ID = c.BrncID
group by ~~branch~~ L.Branch Name ;
```

d) List all the borrowers that are late in returning loaned books.

```
Select *
From borrower , Book-Borrow
where Date Due
```

-2

-2

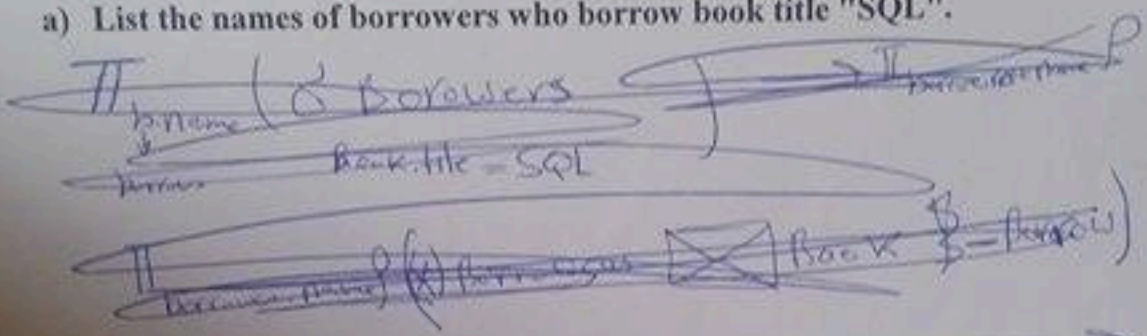
Q4) Consider the following database schema (25 points)

22

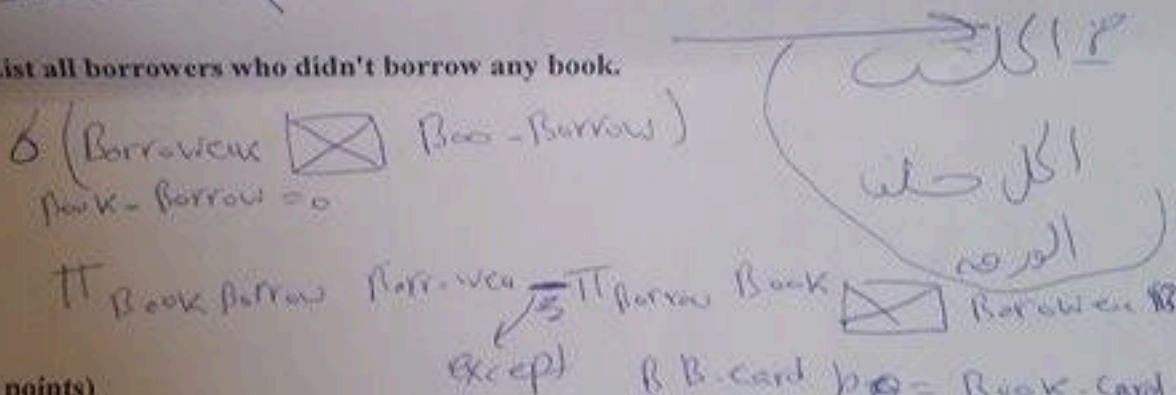
Library(BranchID,BranchName,Address)
Book(BookID,Title,PublisherName)
Publisher(PubID,Name,Address,Phone)
Copies(BookID,BranchID,NoOfCopies)
Authors(BookID,AuthorName)
Book_Borrow(BookID,BranchID,CardNo,DateOut,DateDue)
Borrower(CardNo,Name,Address,Phone)

Write a relational algebra statement to do the following tasks:

a) **List the names of borrowers who borrow book title "SQL".**

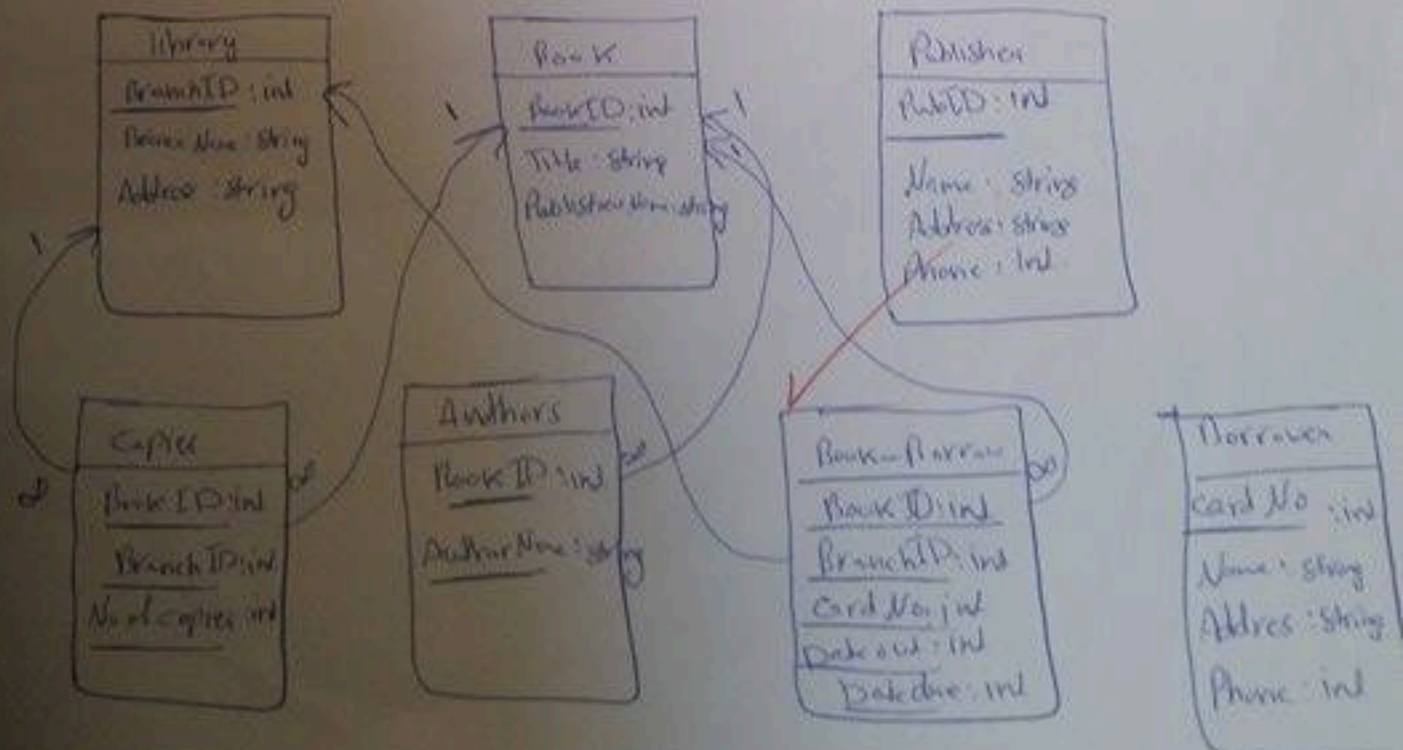


b) **List all borrowers who didn't borrow any book.**



Q#5)(25 points)
Write SQL statements to do the following:

a) **Draw the UML of the above Schema.**



Birzeit University
Computer Science Department

85/100

Comp333
Midterm Exam

Date 5/05/2014

Instructors:Mr. wahbeh Musa ***Time: 1:30 hours***

Student Name : Hiba Fares Student No.: 1111726

Q1) (30 points)

Assume you are building a database for local company. The database requires you to store information about the employees such as *no, name, salary, position (job), rank* (integer field) , the rank of the employee determines his salary and number of vacation days (الإجازات).

Also, the employee has a list of *increases* (علاوات) and *decreases* (خصميات) each identified by no, name, amount.

Write a UML to the above database, just take in consideration the mentioned entities and there needs.

Q2) Consider the following table *Accounts*:(25 points)

AccNum	AccName	City	Balance
1	A	Nablus	900
2	B	Ramallah	200
3	C	Jerusalem	800
4	D	Nablus	400
5	E	Hebron	300
6	F	Hebron	900
7	G	Ramallah	300
8	H	Nablus	560
9	I	Jerusalem	700
10	G	Ramallah	250
11	H	Gaza	300

Show the output of the following statements:

a) **Select sum(balance) as x from Accounts group by city;**

جامعة بيرزيت

BIRZEIT UNIVERSITY

Computer Science Department

Database Systems 333

Midterm **April 24, 2016**

(30%) Question 1

The Palestinian ministry of tourism has contacted you to develop an ER diagram for all hotels.

- There are many hotels. Each hotel has a name, address (street number, street name, city, state, and postal code), a web page URL, and a primary phone number.

- Each hotel consists of a set of rooms arranged on various floors. Each room has an identifier, which is unique within that hotel. Rooms are numbered (e.g. 690), so long as the number is unique within the hotel. Floors are numbered, and it's necessary, for each room, to know what floor it's on, since some customers prefer rooms on lower floors or higher floors.

- For each room, it's also necessary to keep track of how many beds it has, as well as whether smoking is allowed in the room.

- When a guest plans to stay at a hotel in the future, he or she makes a room reservation at the desired hotel. Each reservation indicates information about the guest, the desired arrival and departure dates, as well as preferences that aid in selecting the right kind of room for that guest: whether the room should be smoking or non-smoking, whether the room should have one beds or two, and whether the room should be on a high floor or a low floor. These room preferences are optional, and are not included with every reservation; some guests are willing to take any available room, while some only care about some preferences but not others.

desired hotel. Each reservation indicates information about the guest, the desired arrival and departure dates, as well as preferences that aid in selecting the right kind of room for that guest: whether the room should be smoking or non-smoking, whether the room should have one beds or two, and whether the room should be on a high floor or a low floor. These room preferences are optional, and are not included with every reservation; some guests are willing to take any available room, while some only care about some preferences but not others.

- Also required with each reservation is information about a credit card that's used to secure the reservation; credit cards are indicated by a credit card number (which is a sequence of up to 16 digits) and an expiration date (a month and a year, such as "January 2007").

- The database tracks historical information about every guest's stay in any room in any hotel. At minimum, it is necessary to know what day the stay began, what day it ended, what room it was, what hotel it was, and who the guest was.

- Information about each guest of each hotel is stored. For each guest who has ever reserved or stayed in a room, the database must store the guest's first, middle, and last names, street address, email address, and three phone numbers (home, work, cell). Email addresses and the phone numbers are optional, while the other information is required.

Design an ER diagram for the situation described above. Draw the ER diagram with all its components (entities, relationships, class hierarchies, weak entities, total participation and participation constraints (1-n, m-n, 1-1)). State any **reasonable** assumptions you make.

(35%) Question 2

a) What is the difference between a key and a super key?

b) What is a foreign key?

c) What is the difference between logical data independence and physical data independence?

d) In relational algebra, what is the difference between a natural join and a Cartesian product?

(35%) Question 3

Consider the following relations

- **Student**(snum: **integer**, sname: **string**, major: **string**, level: **string**, age: **integer**)
- **Class**(name: **string**, meets_at: **time**, room: **string**, fid: **integer**)
- **Enrolled**(snum: **integer**, cname: **string**, grade: **string**)
- **Faculty**(fid: **integer**, fname: **string**, deptid: **integer**)
- **Department**(deptid:**integer**, dname:**string**, phone:**int**)

a) List all the classes that are offered by the computer science department.

b) Find the names of students who are enrolled in a class offered by the "COMP" department.

c) Find the names of faculty (teachers) that are not teaching any class.

d) For each class, print the number of students enrolled in that class. Do not print any classes that have less than 5 students.

e) Find the names of all faculty who have conflicts in their schedule; that is they are assigned to teach two different classes at the same time.