

EASTERN MEDITERRANEAN UNIVERSITY

DEPARTMENT OF COMPUTER ENGINEERING

CMPE353/CMSE351

Midterm Examination Multiple Choice Study Questions

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## PART A- Relational Databases and Relational Algebra

Q1) Consider the instances for schemas T and U as given below. The output relation resulting from  $T \text{ OP } U$  is also given.

| T                                                                                                      | U | Output relation (T OP U) |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
|--------------------------------------------------------------------------------------------------------|---|--------------------------|---|---|---|---|-------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|--------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|
| <table><tr><th>A</th><th>B</th></tr><tr><td>a</td><td>1</td></tr><tr><td>b</td><td>2</td></tr></table> | A | B                        | a | 1 | b | 2 | <table><tr><th>B</th><th>C</th></tr><tr><td>1</td><td>x</td></tr><tr><td>1</td><td>y</td></tr><tr><td>3</td><td>z</td></tr></table> | B | C | 1 | x | 1 | y | 3 | z | <table><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>a</td><td>1</td><td>x</td></tr><tr><td>a</td><td>1</td><td>y</td></tr></table> | A | B | C | a | 1 | x | a | 1 | y |
| A                                                                                                      | B |                          |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
| a                                                                                                      | 1 |                          |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
| b                                                                                                      | 2 |                          |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
| B                                                                                                      | C |                          |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
| 1                                                                                                      | x |                          |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
| 1                                                                                                      | y |                          |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
| 3                                                                                                      | z |                          |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
| A                                                                                                      | B | C                        |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
| a                                                                                                      | 1 | x                        |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |
| a                                                                                                      | 1 | y                        |   |   |   |   |                                                                                                                                     |   |   |   |   |   |   |   |   |                                                                                                                                      |   |   |   |   |   |   |   |   |   |

Which of the following relational algebra operators describes OP?

- a) Cartesian product
- b) Natural inner join**
- c) Left outer join
- d) Division

Q2) Consider the instances for schemas T and U as given below. The output relation resulting from  $T \text{ OP } U$  is also given.

| T                                                                                                                                                                                             | U | Output relation (T OP U) |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------------|---|---|---|---|---|---|---|---|---|---|--------------------------------------------------------------------------|---|---|---|--------------------------------------------------------------------------|---|---|---|
| <table><tr><th>A</th><th>B</th></tr><tr><td>a</td><td>1</td></tr><tr><td>a</td><td>2</td></tr><tr><td>b</td><td>1</td></tr><tr><td>b</td><td>2</td></tr><tr><td>c</td><td>1</td></tr></table> | A | B                        | a | 1 | a | 2 | b | 1 | b | 2 | c | 1 | <table><tr><th>B</th></tr><tr><td>1</td></tr><tr><td>2</td></tr></table> | B | 1 | 2 | <table><tr><th>A</th></tr><tr><td>a</td></tr><tr><td>b</td></tr></table> | A | a | b |
| A                                                                                                                                                                                             | B |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| a                                                                                                                                                                                             | 1 |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| a                                                                                                                                                                                             | 2 |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| b                                                                                                                                                                                             | 1 |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| b                                                                                                                                                                                             | 2 |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| c                                                                                                                                                                                             | 1 |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| B                                                                                                                                                                                             |   |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| 1                                                                                                                                                                                             |   |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| 2                                                                                                                                                                                             |   |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| A                                                                                                                                                                                             |   |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| a                                                                                                                                                                                             |   |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |
| b                                                                                                                                                                                             |   |                          |   |   |   |   |   |   |   |   |   |   |                                                                          |   |   |   |                                                                          |   |   |   |

Which of the following relational algebra operators describes OP?

- a) Cartesian product
- b) Set difference
- c) Set intersection
- d) Division**

Q3) Which of the following statements given below regarding keys is/are correct?

- i) An attribute or a set of attributes which uniquely identifies a tuple within a relation is called a superkey.
  - ii) A superkey for which no proper subset is a superkey within the relation is called a candidate key.
  - iii) A relation may have several candidate keys.
  - iv) The chosen candidate key is called a foreign key.
- a) i), ii) and iv)    **b) i), ii) and iii)**    c) i) and iii)    d) ii) and iii)

Consider the following schema definitions for questions 4-10.

The underlined attributes represent the primary keys for each schema.

Branch (branchNo, street, city, postcode)

Staff (staffNo, fName, lName, position, gender, DOB, salary, branchNo)

PropertyforRent(propertyNo,street,city,postcode,type,rooms,rent,ownerNo,staffNo,branchNo)

Client (clientNo, fName, lName, telNo, prefType, maxRent)

PrivateOwner (ownerNo, fName, lName, address, telNo)

Viewing (clientNo, propertyNo, viewDate, comment)

Registration    clientNo, branchNo, staffNo, dateJoined)

The database considers a real estate company which have branches at different cities, staff working at each branch and clients registered to branches. Clients view property which belong to private owners.

Q4)

This relational algebra query finds the names of staff which earn more than \$1000.

Which of the following correctly replaces P and R?

$$\Pi_{fName, lName} ( \sigma_P (R) )$$

- a) P: staff, R: salary>1000
- b) P: salary between 0 and 1000 R: staff
- c) P: maxRent>1000, R: client
- d) P: salary>1000, R: staff**

Q5)

This relational algebra query finds the cities where there is only a branch office.

Which of the following correctly replaces P, op and R?

$$(\Pi_{\text{city}} (P)) \text{ op } (\Pi_{\text{city}} (R))$$

- a) P:PropertyforRent, op: ^, R: Branch
- b) P:PropertyforRent, op:  $\neg$ , R: Branch
- c) P:Branch, op:  $\neg$ , R: PropertyforRent
- d) P:Branch, op:  $\neg$ , R: bPropertyforRent

Q6)

This relational algebra query finds the names and comments of all clients who have viewed a property.

Which of the following correctly replaces P and R?

$$\Pi_{\text{fName,lName,comment}}(\sigma_P(R))$$

- a) P: client,viewing, R: client.client.No=viewing.clientNo
- b) P: propertyforRent,client, R: client.client.No=viewing.clientNo
- c) P: client.client.No=viewing.clientNo, R: client x viewing
- d) P: client.client.No=viewing.clientNo, R:client,viewing

Q7)

The following relational algebra query produces a relation consisting of properties which have been viewed with comments and those that have not been viewed.

Which of the following correctly replaces P, op, and R?

$$\Pi_{\text{propertyNo,comment}}(P \text{ op } R)$$

- a) P: PropertyforRent, op:  $\times$ , R: Viewing (left join)
- b) P: PropertyforRent, op:  $\times$ , R: Viewing (right join)
- c) P: Viewing, op:  $\times$ , R: PropertyforRent (natural join)
- d) P: Viewing, op:  $\times$ , R: PropertyforRent (left join)

Q9)

This relational algebra query finds the number of staff working in each branch and the total salaries paid at each branch.

Which of the following correctly replaces P?

P (staff)

- a) city G count(\*),sum(salary)
- b) sum(salary),count(staffNo) G branchNo
- c) branchNo G count(staffNo), sum(salary)
- d) branchNo G count(\*), sum(\*)

Q10)

Which of the following relational algebra expression changes the postcode for branch B110 to 941205?

- a)  $\Pi_{\text{branchNo}, \text{street}, \text{city}, 941205} (\sigma_{\text{branchNo}=\text{B110}}(\text{branch}))$
- b)  $\text{branch} \leftarrow \Pi_{\text{branchNo}=\text{B110}, \text{street}, \text{city}, \text{postcode}=941205}$
- c)  $\Pi_{\text{postcode}=941205} (\sigma_{\text{branchNo}=\text{B110}}(\text{branch}))$
- d)  $\text{branch} \leftarrow \Pi_{\text{branchNo}, \text{street}, \text{city}, 941205} (\sigma_{\text{branchNo}=\text{B110}}(\text{branch}))$

## **Part B - SQL**

Consider the same database as in Part A of this exam whose schema definitions were given as:

Branch (branchNo, street, city, postcode)

Staff (staffNo, fName, lName, position, gender, DOB, salary, branchNo)

PropertyforRent(propertyNo,street,city,postcode,type,rooms,rent,ownerNo,staffNo,branchNo)

Client (clientNo, fName, lName, telNo, prefType, maxRent)

PrivateOwner (ownerNo, fName, lName, address, telNo)

Viewing (clientNo, propertyNo, viewDate, comment)

Registration clientNo, branchNo, staffNo, dateJoined)

Answer questions 11-20 using these schema definitions.

Q11) The following SQL query produces a list of monthly salaries for staff (assume that annual staff salaries are stored in the database).

Which of the following correctly replaces A?

**select staffNo, A**

**from Staff**

- a) A: salary=salary/12
- b) A: salary/12**
- c) A: set salary=salary/12
- d) A: update salary=salary/12

Q12) The following SQL query lists all owners whose address contains the string 'Istanbul'.

Which of the following correctly replaces P?

```
select ownerNo, fName, lName, address  
from PrivateOwner  
where P
```

- a) P: address='Istanbul'
- b) P: address LIKE 'Istanbul%'
- c) P: address LIKE '%Istanbul%'**
- d) P: address='%Istanbul%'

Q13) The following SQL query lists the detail of all viewings on property P6 where a comment has not been submitted.

Which of the following correctly replaces P?

```
select clientNo,viewDate  
from Viewing  
where propertyNo='P6' AND P
```

- a) P: comment=' '
- b) P: comment IS NULL**
- c) P: comment NOT IN NULL
- d) P: comment IN 'NULL'

Q14) The following output relation is obtained when the SQL query below is executed:

**select propertyNo,type,rooms,rent**

**from PropertyforRent**

**A**

Which of the following correctly replaces A?

| propertyNo | type  | rooms | rent |
|------------|-------|-------|------|
| P16        | Flat  | 4     | 450  |
| P94        | Flat  | 4     | 400  |
| P36        | Flat  | 3     | 375  |
| P4         | Flat  | 3     | 350  |
| P14        | House | 6     | 650  |
| P21        | House | 5     | 600  |

- a) A: GROUP BY propertyNo
- b) A: ORDER BY rent, type ASC
- c) A: ORDER BY type, rent
- d) A: ORDER BY type, rent DESC

Q15) The following SQL query finds the number of properties managed by each staff member at each branch.

Which of the following correctly replaces A and B?

**select A**

**from staff s, propertyforRent p**

**where s.staffNo=p.staffNo**

**B**

- a) A: s.branchNo, s.staffNo, count(\*), B: GROUP BY s.branchNo,s.staffNo
- b) A: count(\*), B: GROUP BY s.branchNo,s.staffNo
- c) A: s.branchNo, count(\*), B: GROUP BY s.branchNo,s.staffNo
- d) A: s.branchNo, s.staffNo, count(\*), B: GROUP BY s.branchNo



Q16) What does the following SQL query do?

```
select *  
from PropertyforRent  
where staffNo IN (select staffNo  
                  from Staff  
                  where branchNo IN ( select branchNo  
                                     from Branch  
                                     where street = 'High St'))
```

- a) Finds all property located on High St.
- b) Finds all staff and property located at a branch on High St
- c) Finds all property handled by a staff member who works at a branch located on High St.**
- d) Finds all property handled by a staff member and branches located on High St.

Q17) The following SQL query lists all branches and properties which are in the same city.

Which of the following correctly replaces A?

```
select brancNo, propertyNo  
from A
```

- a) A: Branch B full outer join PropertyforRent P on B.city=P.city
- b) A: Branch inner join PropertyforRent using(branchNo)
- c) A: Branch inner join PropertyforRent using(city)**
- d) A: Branch, PropertyforRent

Q18) The following SQL code is used to insert a new branch whose number is B71 located in Istanbul.

```
insert into branch (city,branchNo)  
values ('Istanbul', 'B71')
```

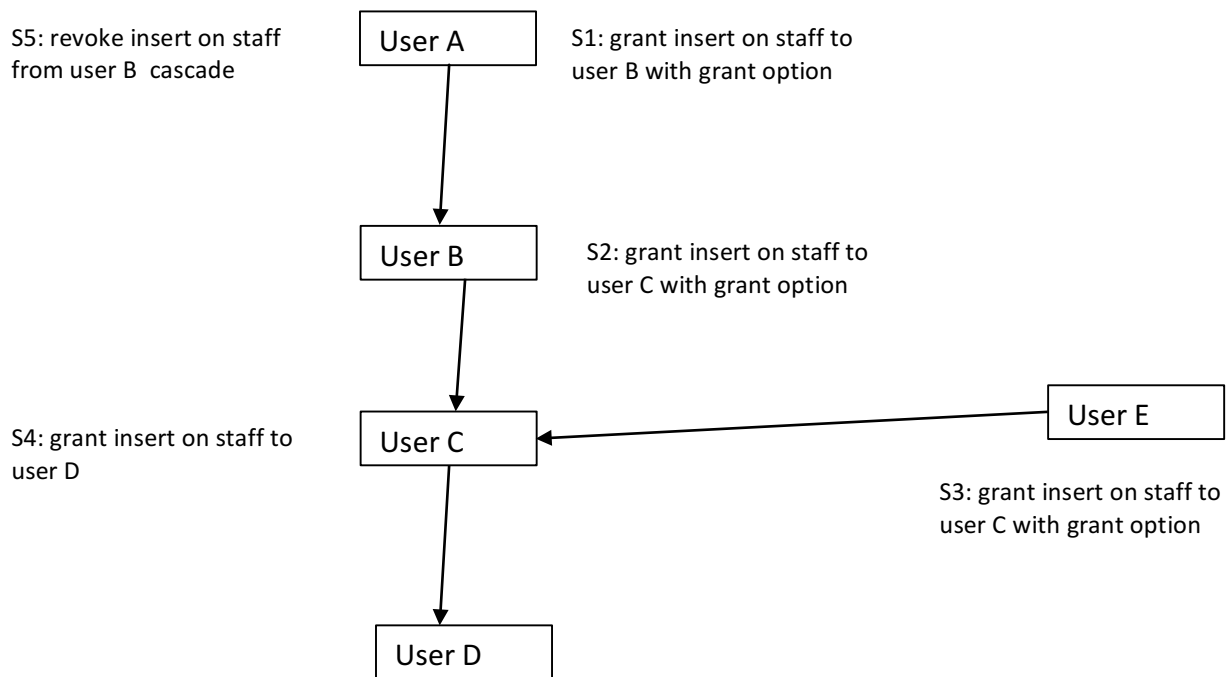
Which of the following shows the contents of this new row in the branch table?

- a) (Istanbul,B71)
- b) (B71,Istanbul)
- c) (B71,Istanbul,NULL,NULL)
- d) (B71,NULL,Istanbul,NULL)

Q19) What is the minimum number of integrity constraints that must be used when creating the Viewing table? (Assume that the view date cannot be left empty and the comments can only take the values Poor, Good or Wonderful).

- a) 2
- b) 5
- c) 3
- d) 4

Q20) Consider the following authorization diagram which shows a series of authorization statements step1 through step5 issued on table **staff** by different users. (The statement issued by a user is written next to the user name. Sx: represents the step no)



Which user(s) still have the privilege to insert data in the staff table after all steps have been completed?

- a) Users A and E only
- b) Users C and D only
- c) Users E and D only
- d) All users except B