Database Management System: Assignment 3

Total Marks : 20

January 31, 2024

Question 1

Marks: 2 **MCQ**

Consider the following instances:

University			
UName	Branch	Capacity	Fees
JFTT	Bangalore	15000	200000
KSSL	Bangalore	40000	500000
JFTT	Jalandhar	5000	200000
LKUniversity	Kolkata	2000	100000
LKUniversity	Mumbai	2000	150000

Consider the Relational Algebra on these given instances:
$\Pi_{\texttt{UName,Branch,Capacity}}(\texttt{University}) \div (\Pi_{\texttt{Branch,Capacity}}(\sigma_{\texttt{Fees<=200000}}\texttt{University}) \cap \Pi_{\texttt{Branch,Capacity}}(\sigma_{\texttt{Capacity>2000}}\texttt{University}))$

What is the output of the Relational Algebra?

a) JFTT.

b) KSSL.

c) LKUniversity.

d) No row will be selected.

Answer: a)
Explanation: As per the syntax and semantics of Relational Algebra.
Hence, option (a) is correct.

Question 2

Marks: 2 **MCQ**

Consider the following instances:

Dishes		
Name	Price	Rating
Pasta	800	5
Fajita	500	4
Pizza	1000	4
Pasta	200	5
Pasta	150	5
Cheesecake	800	5

Dips		
Name	Price	Rating
Cheese	200	5
Hummus	150	5
Salsa	80	4

How many tuples are returned by the following Relational Algebra?
$\Pi_{Dips.Name}(Dips \cap (Dips \bowtie (\sigma_{Dips1.Rating<5 \vee Dips1.Price \leq 80}(\rho_{Dips1}(Dips)))))$

a) 1

b) 2

c) 3

d) 4

Answer: a)
Explanation: The Relational Algebra returns `Salsa` as output.
Hence, option (a) is correct.

Question 3

Marks: 2 **MCQ**

Consider the relational schema `Sensor(SensorID, Battery, BaseStationID, Range)`. Choose the correct Tuple Relational Calculus that represents the following statement *"Display all the SensorIDs associated with BaseStationID BS1."*

a) {s|t < t[BaseStationID]='BS1'>}

b) {<s, t>|∃s ∈ Sensor (p[BaseStationID]='BS1')}

c) {t|∃s ∈ Sensor (t[SensorID]=s[BaseStationID] ∧ t[BaseStationID]='BS1')}

d) {t|∃s ∈ Sensor (t[SensorID]=s[SensorID] ∧ s[BaseStationID]='BS1')}

Answer: d)
Explanation: The tuple to be selected is represented by `'t'` and the selection conditions are written with ∧ as per the given question. According to the projection and selection operations shown in lecture slides 12.26 - 12.28, option (d) shows the correct syntax and semantics of the Tuple Relational Calculus.

Question 4

Marks: 2 **MCQ**

Consider the relational schema `Sensor(SensorID, Battery, BaseStationID, Range)`. Choose the correct Domain Relational Calculus equivalent to the following SQL query `SELECT Range FROM Sensor WHERE Battery='500'`

a) {s|∃c, d, i (c, d, i, s ∈ Sensor ∧ Battery='500')}

b) {<s>|∃c, d, i (<c, d, i, s> ∈ Sensor ∧ d='500')}

c) {<s>|∃c, d, i (<c, d, i> ∈ s ∧ Battery='500')}

d) {s|∃<c, d, i> (c, d, i, s ∈ Sensor ∧ d='500')}

Answer: b)
Explanation: According to the syntax and semantics of Domain Relational Algebra shown in lecture slides 12.26-12.28.

Question 5

Marks: 2 **MCQ**

A C program, with embedded SQL query allows the users to enter their Year of Birth and Country which are stored in variables `yob` and `cou` respectively. The SQL command returns the `counts` of those all other people born in the same year and country from `Person(id, Birth, Country)`.
Which of the following SQL queries is correct for the purpose?

a)
```
EXEC SQL
DECLARE c CURSOR AS
SELECT id
FROM Person
WHERE Birth==yob AND Country==cou
END_EXEC
```

b)
```
EXEC SQL
DECLARE c CURSOR FOR
SELECT count(id)
FROM Person
WHERE :Birth= :yob & :Country=:cou
END_EXEC
```

c)
```
EXEC SQL
DECLARE c CURSOR AS
SELECT id
FROM Person
WHERE :Birth==yob & :Country==cou
END_EXEC
```

d)
```
EXEC SQL
DECLARE c CURSOR FOR
SELECT count(id)
FROM Person
WHERE Birth=:yob AND Country=:cou
END_EXEC
```

Answer: d)
Explanation: As per the syntax and semantics of embedded SQL, option (d) is correct.

Question 6

Marks: 2 **MCQ**

A company maintains a schema of `Reports` where each report is identified by a Heading. The reports are also associated with corresponding a Date and Length. Moreover, each report can be written by multiple Authors. Which of the following schema correctly represents the `Reports` entity set?

a) Reports(Heading, Date, Length, Authors)

b) Reports(Heading, Date, Length), Reports1(Heading, Authors)

c) Reports(Heading, Date, Length), Reports1(Heading, Authors)

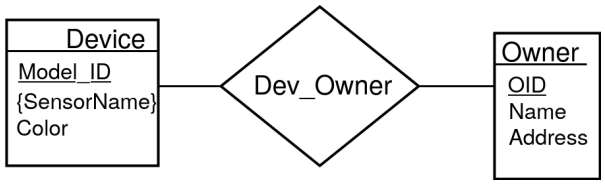
d) Reports(Heading, Date, Length), Reports1(Heading, Authors)

Answer: d)
Explanation: Multi valued attributes like `Authors` should be placed in a separate schema where it is used as an attribute of the composite primary key, along with the unique identifier. Hence, option (d) is correct.

Question 7

Marks: 2 **MCQ**

Consider the Entity Relationship Diagram



Which of the following is true?

a) The schema for the `Device` entity will be `Device(Model_ID, Color)` and `DeviceSensor(Model_ID, SensorName)`.

b) The schema for the `Dev_Owner` will be `Dev_Owner(Model_ID, OID)`.

c) The schema for the `Owner` will be `Owner(OID, Model_ID, Name, Address)`.

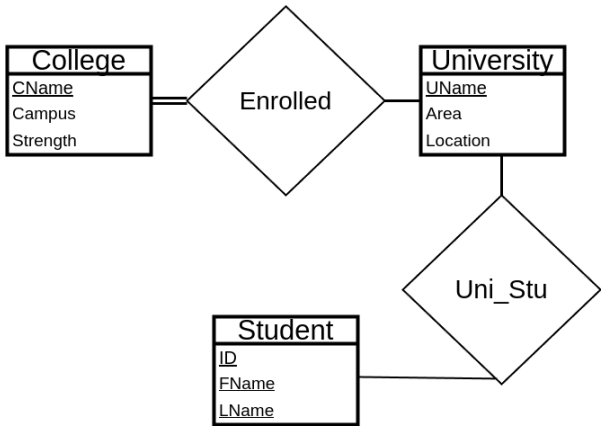
d) The schema for the `Device` entity will be `Device(Model_ID)` and `DeviceSensor(SensorName, Color)`.

Answer: b)
A multi valued attribute is placed in a separate schema with the primary attribute of the entity. Hence, options (a) and (d) are not true. Similarly, the schema for `Owner` will be `Owner(OID, Name, Address)`. Thus, option (b) is correct.

Question 8

Marks: 2 **MCQ**

Consider the Entity Relationship Diagram



Which of the following is true?

a) Participation of `College` in `University` is total.

b) Participation of `College` in `Enrolled` is total.

c) Participation of `Student` in `University` is partial.

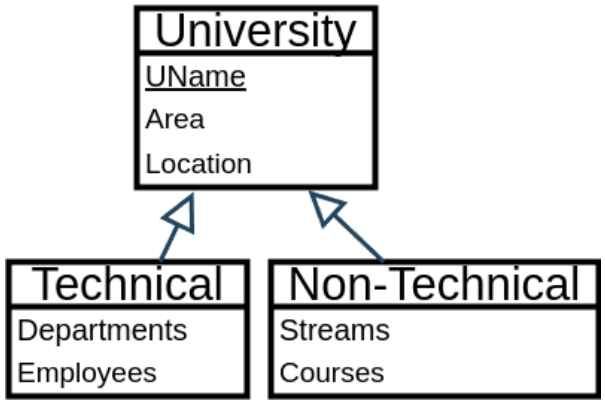
d) Participation of `Uni_Stu` in `Student` is partial.

Answer: b)
Total participation of an entity in a relation is indicated by a double line whereas partial participation (default) is indicated by single lines. Hence, option (b) is correct.

Question 9

Marks: 2 **MSQ**

Consider the Entity Relationship Diagram



Which of the following is false?

a) The schema of `University` is `University(UName, Area, Location)`.

b) The schema of `University` is `University(UName, Area, Location, Departments, Employees)`.

c) The schema of `Technical` is `Technical(UName, Departments, Employees)`.

d) The schema of `Technical` are `Technical1(UName, Departments)` and `Technical2(UName, Employees)`.

Answer: b), d)
Refer to week 3, slide 15.11. Hence, options (b) and (d) are the answer.

Question 10

Marks: 2 **MCQ**

An organization, collecting car renters' information, considers the following relations:

```
Renter(Renter_ID, Contact)
Renting(Renter_ID, Car_Number)
Car(Car_Number, Model).
```

What will the following relational algebra expression return to the organization?

$\Pi_{Car\_Number}(Car) - \Pi_{Car\_Number}(Renter \bowtie Renting)$

a) The `Car_Number` of those `Car`s that are rented by at most one `Renter`.

b) The `Car_Number` of those `Car`s that are rented by at least one `Renter`.

c) The `Car_Number` of those `Car`s that are rented by all `Renter`s.

d) The `Car_Number` of those `Car`s that are not rented by any `Renter`.

Answer: d)
As per the syntax and semantics of Relational Algebra Queries. Hence, option (d) is correct.