Database Management System: Assignment 1

Total Marks : 20

January 15, 2024

Question 1

Marks: 2 **MCQ**

A relation `R` has 2 candidate keys with 1 attribute each. There are 6 possible super keys of `R`. What is the total number of attributes in `R`?

a) 2

b) 3

c) 4

d) 5

Answer: (b)
Explanation: A relation `R` with `n` attributes and 2 candidate keys having 1 attribute each respectively, has $K = 2^{(n-1)} + 2^{(n-1)} - 2^{(n-2)}$ superkeys. Here, K = 6 So, n = 3.
Hence, option (b) is correct.

Question 2

Marks: 2 **MCQ**

Consider the following instances of the relation:
`SEMESTER1(Student, Marks)` and `SEMESTER2(Student, Marks)`

SEMESTER1	
Student	**Marks**
Akshay	67
Gunjan	90
Aman	65
Arani	98

SEMESTER2	
Student	**Marks**
Akshay	89
Aman	23
Arani	76

Which of the following Relational Algebra produces the Name and `SEMESTER1 Marks` of only those `Student`s who did not appear in `SEMESTER2`?

a) $(\Pi_{\texttt{Student}}(\texttt{SEMESTER2}) - \Pi_{\texttt{Student}}(\texttt{SEMESTER1})) \bowtie \texttt{SEMESTER1}$

b) $(\Pi_{\texttt{Student}}(\texttt{SEMESTER2}) - \Pi_{\texttt{Student}}(\texttt{SEMESTER1})) \bowtie \texttt{SEMESTER2}$

c) $(\Pi_{\texttt{Student}}(\texttt{SEMESTER1}) - \Pi_{\texttt{Student}}(\texttt{SEMESTER2})) \bowtie \texttt{SEMESTER2}$

d) $(\Pi_{\texttt{Student}}(\texttt{SEMESTER1}) - \Pi_{\texttt{Student}}(\texttt{SEMESTER2})) \bowtie \texttt{SEMESTER1}$

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

Question 3

Marks: 2 **MCQ**

Consider the following instance of the relation `Counters(CNo, Item, Price, Category)`

Counters			
CNo	**Item**	**Price**	**Category**
12	Food	500-1000	LP
2	Clothes	500-1000	LP
12	Makeup	100-20000	AP
2	Clothes	1001-20000	HP
3	Food	1001-50000	HP

Identify the valid primary key for the relation `Counters(CNo, Item, Price, Category)` from the given instance.

a) {CNo, Item}

b) {Item, Price}

c) {Price, Category}

d) {CNo, Item, Category}

Answer: (b)
Explanation: A primary key needs to uniquely identify each record in a table. So option b) is the correct option. Option (d) is incorrect as it forms a superkey. Other options are incorrect as these attributes do not identify each tuple uniquely.

Question 4

Marks: 2 **MCQ**

Consider the following instance of the relation `Seating(SNo, Preference, Coach, Name)`

Seating			
SNo	**Preference**	**Coach**	**Name**
1	WS	D1	Harsh S.
2	NP	D1	Anukul K.
3	WS	D1	Harsh S.
4	WS	D2	Raima H.
5	NWS	D2	Raima H.

Identifying the primary key from the given instance, select the tuple that can NOT be inserted to `Seating` ?

a) `(11, WS, D1, Harsh S.)`

b) `(2, NP, D2, Anukul K.)`

c) `(6, NWS, D2, Raima H.)`

d) `(6, NULL, NULL, NULL)`

Answer: b)
Explanation: In `Seating(SNo, Preference, Coach, Name)`, `SNo` is the primary key and should be unique. Hence, option (b) is correct.

Question 5

Marks: 2 **MCQ**

Consider the following RA:

$$\Pi_{track}(\sigma_{category=`Pop'}(Music))$$

Which of the following statements is true?

a) Displays the details of all Music from Pop Category

b) Displays the details of at least one Music from Pop Category

c) Displays at most one track from Pop Category

d) Displays all the tracks from Pop Category

Answer: d)
Explanation: As per the syntax of Relational Algebra.

Question 6

Marks: 2 **MCQ**

Let $\mathtt{R_1}(\underline{\mathtt{X}},\mathtt{Y})$ and $\mathtt{R_2}(\underline{\mathtt{A}},\mathtt{B},\mathtt{C})$ be two relations in a schema. The primary keys are shown underlined. Let $\mathtt{C}$ be a foreign key in $\mathtt{R_2}$ referring to $\mathtt{R_1}$. Suppose, there is no violation of the above referential integrity constraint in the corresponding relation instances r_1 and r_2.
Which one of the following relational algebra expressions would necessarily produce an empty relation?

a) $\prod_{\mathtt{X}}(r_1) - \prod_{\mathtt{C}}(r_2)$

b) $\prod_{\mathtt{C}}(r_2) - \prod_{\mathtt{X}}(r_1)$

c) $\prod_{\mathtt{X}}(r_1 \bowtie r_2)$

d) $\prod_{\mathtt{C}}(r_1 \bowtie r_2)$

Answer: b)
Explanation: According to Foreign key concept $\prod_X(r_1) \geq \prod_C(r_2)$
So, $\prod_C(r_2) - \prod_X(r_1) = \phi$.
So, option (b) is correct.

Question 7

Marks: 2 **MCQ**

Consider the following relations:

```
Parts(PartID, Name, Price ).
Supplier(SupID, Name, Location).
Order(SupID, PartID, Quantity) .
```

If `SupID and PartID` together are used to uniquely identify a row in `Order` table, which of the following option is correct for describing such key in `Order` table?

a) Alternate key

b) Composite key

c) Compound key

d) Surrogate key

Answer: c)

Explanation:
Compound key: two or more attributes jointly can identify a record uniquely. However, each of these attributes, individually, are simple (foreign) keys in their own tables. .
Hence, option (c) is correct.

Question 8

Marks: 2 **MCQ**

Consider the following table:

StudentDetails			
StudName	DeptName	Address	Age
Ayush	CSE	Kolkata	28
Priya	CSE	Hyderabad	24
Ankush	IT	Kolkata	30
Rumki	IT	Hyderabad	25
Sujit	ECE	Bangalore	24
Sayan	IEE	Mumbai	28

Identify the correct operation(s) which produces the following output from the above `relation`.

StudentDetails			
StudName	DeptName	Address	Age
Ayush	CSE	Kolkata	28
Ankush	IT	Kolkata	30
Sayan	IEE	Mumbai	28

a) $\prod_{\texttt{(Address='Kolkata') } \wedge \texttt{ (Age}>25\texttt{)}}(\texttt{StudentDetails})$

b) $\prod_{\texttt{(Address='Kolkata') } \vee \texttt{ (Age}>25\texttt{)}}(\texttt{StudentDetails})$

c) $\sigma_{\texttt{(Address='Kolkata') } \wedge \texttt{ (Age}>25\texttt{)}}(\texttt{StudentDetails})$

d) $\sigma_{\texttt{(Address='Kolkata') } \vee \texttt{ (Age}>25\texttt{)}}(\texttt{StudentDetails})$

Answer: d)
Explanation: As per `Relational Operators syntax and semantics`, option d) is correct.

Question 9

Marks: 2 **MSQ**

Consider the following tables:

Student	
StudName	DeptName
Ayush	CSE
Raja	IT
Priya	EE

Department	
DeptName	Fees
CSE	6000
IT	7000
EE	5000
ECE	5000

Identify the correct operation(s) which will produce the following output from the above `two relations`.

StudName	DeptName	Fees
Ayush	CSE	6000
Raja	IT	7000
Priya	EE	5000

a) (`Student` $\times$ `Department`)

b) $\prod_{\texttt{(StudName,Student.DeptName, Fees)}}(\sigma_{\texttt{(Student.DeptName=Department.Deptname)}}(\texttt{Student} \times \texttt{Department}))$

c) $\sigma_{\texttt{(StudName,Student.DeptName, Fees)}}(\texttt{Student} \bowtie \texttt{Department})$

d) (`Student` $\bowtie$ `Department`)

Answer: b), d)
Explanation: As per `Relational Operators syntax and semantics`, options b) and d) are correct.

Question 10

Marks: 2 **MCQ**

Which of the following can be a `candidate key` for the following instance?

StudentDetails			
StudName	DeptName	Address	Age
Ayush	CSE	Kolkata	28
Priya	CSE	Hyderabad	25
Ankush	IT	Kolkata	30
Rumki	IT	Hyderabad	25
Sujit	ECE	Bangalore	24
Sujit	IEE	Mumbai	28

a) {StudName}

b) {DeptName}

c) {StudName, DeptName}

d) {Address, Age}

Answer: c)
Explanation: In the above instance, each row can be uniquely identified by using {StudName, DeptName} set of attributes only as per given options.
Hence, (c) is the correct option.