NOC24-CS75
Data Base Management System

Tutorial by: Adwait P. Parsodkar
Week - 1

General Instructions

1. Tutorials every Friday from 6 PM to 8 PM on the same link.
2. Discussion only on that week's contents.
3. No discussions on weekly assignments.
4. Please keep your videos off.
5. Recording of the tutorial will be uploaded on YouTube.
6. We might encounter technical glitches occasionally. Please cooperate :)
7. Do not leave the link in case of network issues (from your or my end).

Question 1

Which level of abstraction describes types of data that are stored in the Database?

a) Physical level

b) Logical level

c) View level

d) Abstraction level

Solution 1

Solution: (b)

We have three levels of abstraction:

Physical level: This is the lowest level of data abstraction. It describes how data is physically stored in database.

Logical level: This is the middle level of 3-level data abstraction architecture. It describes which type of data is stored in database.

View level: The highest level of data abstraction. This level describes the user interaction with database system.

Question 2

Identify a valid primary key for the relation paper info from the given instance.

(a) paper id

(b) paper id, corresponding Author

(c) conference id, corresponding Author

(d) paper id, conference id

paper_info

paper_id	corresponding_Author	conference_id	Area
1005	Steven	1654	HCI
2134	Dave	1654	HCI
367	Himani	6743	5G
1005	Steven	6743	5G
4987	Himani	6743	HCI

Solution 2

Solution: (d)

A primary key needs to uniquely identify each record in a table. So option (d) is the correct option. Other options are incorrect as these attributes do not identify each tuple uniquely.

Question 3

Identify the correct statement(s).

a) Project(pCode, pName) is an instance of a relation schema.

b) Project(pCode, pName) is an example of a physical schema.

c) (2245, HardFort) is an instance of a relation schema.

d) (2245, HardFort) is an example of a logical schema.

Solution 3

Solution: (c)

(2245, HardFort) is an instance of the schema Project(pCode, pName)

Question 4

Consider a relation Vehicle(VID, Model, Speed, Color) where the superkeys are as follows:

{VID}, {VID, Model}, {Speed, Color}, {Speed, Color, Model}.

Select the possible candidate key(s).

a) {VID}

b) {Speed}

c) {Color}

d) {Speed, Color}

Solution 4

Solution: (a) and (d)

Minimal superkeys are candidate keys. Here, VID alone is a superkey, hence, any superset of VID will also be a superkey. But only VID can be a candidate key. Similarly, {Speed, Color} is a superkey and so is any of its superset. But, {Speed, Color} is minimal, as, removing any one attribute from the set makes it ineligible to remain as a superkey. So {Speed, Color} is also a valid candidate key.

Review of operators

Operator	Meaning
σ	Select
π	Project
$\times$	Cartesian product
$\cap$	Intersection
$\cup$	Union
$-$	Set difference
$\bowtie$	Natural Join

Question 5

Consider the following relations:

Book(ISBN,Title,Pages)

BookGenre(ISBN,Genre)

What does the following relational algebra expression represent?

$\Pi_{ISBN}((\sigma_{Pages>100}Book) \bowtie (\sigma_{Genre='Fiction'},BookGenre))$

a) Find the ISBN of all Book with more than 100 Pages.

b) Find the ISBN of all Book with more than 100 Pages or are of Genre ‘Fiction’.

c) Find the ISBN of all Book with more than 100 Pages but are not of Genre ‘Fiction’.

d) Find the ISBN of all Book with more than 100 Pages and are of Genre ‘Fiction’ .

Solution 5

Solution: (d)

Question 6

Consider the following relational schema:

ImageCode(ImageID, Name)

ImageBook(BookID, ImageID, Page)

What will be the Relational Algebra equivalent to the following statement?

“Find the names of all Images on Page 100.”

a) $\sigma_{Name}(ImageCode \bowtie \sigma_{Page=100}(ImageBook))$

b) $\sigma_{Name}(\Pi_{Page=100}(ImageCode) \bowtie ImageBook)$

c) $\Pi_{Name}(\Pi_{Page=100}(ImageCode) \bowtie ImageBook)$

d) $\Pi_{Name}(ImageCode \bowtie \sigma_{Page=100}(ImageBook))$

Solution 6

Solution: (d)

Question 7

Consider the following tables:

S1	
Student	Roll
Aditi	1
Mridul	8
Pritam	5
Shreya	2
Shreyan	6

S2	
Student	Roll
Shreya	2
Mridul	8
Tina	9

Which of the following operations will return S1 itself?

(a) S2-(S2-S1) (b) S1-(S2-S1) (c) S1-(S1-S2) (d) S2-(S1-S2)

Solution 7

Solution: (b)

S2-S1 will result in {Tina,9} which when subtracted from S1, returns only the tuples in S1.

Hence, option b) is correct.

Question 8

Consider the following table:

UniversitiesDetails			
StateName	#CentralUniversities	#StateUniversities	#Faculties
Assam	2	18	15000
Bihar	4	18	18000
Delhi	7	11	20000
Gujarat	1	29	25000
Kerala	1	15	15000
West Bengal	1	36	40000

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

UniversitiesDetails		
StateName	#StateUniversities	#Faculties
Delhi	11	20000
Gujarat	29	25000
West Bengal	36	40000

a) $\sigma_{\texttt{(\#Faculties>=20000)}}$ (UniversitiesDetails)

b) $\sigma_{\texttt{(\#Faculties>20000)}}$ (UniversitiesDetails)

c) $\Pi_{\texttt{StateName,\#StateUniversities,\#Faculties}}\ \sigma_{\texttt{(\#Faculties>=20000)}}$ (UniversitiesDetails)

d) $\Pi_{\texttt{StateName,\#StateUniversities,\#Faculties}}\ \sigma_{\texttt{(\#Faculties>20000)}}$ (UniversitiesDetails)

Solution 8

Solution: (c)

Question 9

Consider the following tables:

Details$_1$		
StateName	#StateUniversities	#Faculties
Delhi	11	20000
Gujarat	29	25000
West Bengal	36	40000

Details$_2$		
StateName	#StateUniversities	#Faculties
Delhi	11	20000
Tamil Nadu	22	26000
Uttarakhand	11	12000

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

StateName	#StateUniversities	#Faculties
Gujarat	29	25000
West Bengal	36	40000
Tamil Nadu	22	26000
Uttarakhand	11	12000

a) $\texttt{Details}_1 - \texttt{Details}_2$

b) $\texttt{Details}_2 - \texttt{Details}_1$

c) $(\texttt{Details}_1 \cup \texttt{Details}_2) \cap (\texttt{Details}_1 \cap \texttt{Details}_2)$

d) $(\texttt{Details}_1 - \texttt{Details}_2) \cup (\texttt{Details}_2 - \texttt{Details}_1)$

Solution 9

Solution: (d)

Question 10

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

UniversitiesDetails			
StateName	#CentralUniversities	#StateUniversities	#Faculties
Assam	2	18	15000
Bihar	4	18	18000
Delhi	7	11	20000
Gujarat	1	29	25000
Kerala	1	15	15000
West Bengal	1	36	40000

(a) {StateName} (b) {#StateUniversities} (c) {#Faculties}

(d) {StateName, #CentralUniversities, #StateUniversities}

Solution 10

Solution: (a)

In the above instance, each row can be uniquely identified by using {StateName} attribute only.

Hence, (a) is the correct option.

Question 11

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?

Solution 11

Let the two candidate keys be A and B.

The minimum number of attributes is 2.

If there is a third attribute C, then the superkeys would be

{A, B, AB, AC, BC, ABC}

Therefore there are 3 attributes.

Question 12

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

Solution 12

Solution: d

Question 13

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}

Solution 13

Solution: b

Question 14

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)`

Solution 14

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

Question 15

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

Solution 15

Solution: d

Question 16

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

Solution 16

Solution: b

Question 17

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

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

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

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

Solution 17

Solution: d

Question 18

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) $(\texttt{Student} \times \texttt{Department})$

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) $(\texttt{Student} \bowtie \texttt{Department})$

Solution 18

Solution: b, d