



EPPS6354 Information Management

Assignment3

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Assignment 3

Q1

- What are the differences between relation schema, relation and instance? Give an example using the university database to illustrate.

Understanding the differences between relation schema, relation, and instance is crucial in the context of database management systems, specifically relational databases. Here's a detailed explanation of each term, followed by an example using a university database to illustrate these concepts:

- 1) **Relation Schema:** A relation schema is a blueprint that defines the structure of a relation, including the name of the relation, and the names and types of each column. It is essentially the metadata that describes the relation. A relation schema is static, meaning it does not change often.
- 2) **Relation:** A relation, in the context of a relational database, is a table composed of rows and columns. The term "relation" is used interchangeably with "table". It is the structure defined by the schema and can store actual data. Each row in the relation represents a record, and each column represents an attribute of the data.
- 3) **Instance:** An instance of a database refers to the contents of a database at a particular point in time. It's a snapshot of the data in all the relations (tables) of the database. Instances of a relation are dynamic, meaning they can change over time as data is inserted, updated, or deleted.

Assignment 3

Q1

► What are the differences between relation schema, relation and instance? Give an example using the university database to illustrate.

1) **Relation Schema:** Consider a relation schema for a table named Students, which might be defined as Students(SID: integer, Name: varchar, Major: varchar, Year: integer). This schema outlines that the Students table will have four columns: SID (student ID, an integer), Name (a variable character string), Major (also a variable character string), and Year (an integer representing the year in school).

2) **Relation (Table):** Based on the above schema, the Students relation (or table) would be structured to hold records of students, with each record comprising an SID, Name, Major, and Year. However, at this point, we're only talking about the structure without referring to any specific data.

3) **Instance of the Relation** (Specific Data at a Time): An instance of the Students table would be the actual data contained in the table at any given time.

Assignment 3

Q2

► What are the differences between relation schema, relation and instance? Give an example using the university database to illustrate.

1) **Relation Schema:** Consider a relation schema for a table named Students, which might be defined as Students(SID: integer, Name: varchar, Major: varchar, Year: integer). This schema outlines that the Students table will have four columns: SID (student ID, an integer), Name (a variable character string), Major (also a variable character string), and Year (an integer representing the year in school).

2) **Relation (Table):** Based on the above schema, the Students relation (or table) would be structured to hold records of students, with each record comprising an SID, Name, Major, and Year. However, at this point, we're only talking about the structure without referring to any specific data.

3) **Instance of the Relation** (Specific Data at a Time): An instance of the Students table would be the actual data contained in the table at any given time.

Assignment 3

Q2 –Write SQL codes to get a list of;

- Student IDs (hint from the *takes* relation)

Enter SQL commands here

```
1 select distinct id from takes-- enter your commands here
```

Execute

Save the db

Load an SQLite database file: Choose File No file chosen

ID
00128
12345
19991
23121
44553
45678
54321
55739
76543
76653
98765
98988

Assignment 3

Q2 –Write SQL codes to get a list of;

i) Students – all attributes

Enter SQL commands here

```
1 select * from student;-- enter your commands here
```

Execute

Save the db

Load an SQLite database file:

Choose File

No file chosen

ID	name	dept_name	tot_cred
00128	Zhang	Comp. Sci.	102
12345	Shankar	Comp. Sci.	32
19991	Brandt	History	80
23121	Chavez	Finance	110
44553	Peltier	Physics	56
45678	Levy	Physics	46
54321	Williams	Comp. Sci.	54
55739	Sanchez	Music	38
70557	Snow	Physics	0
76543	Brown	Comp. Sci.	58
76653	Aoi	Elec. Eng.	60
98765	Bourikas	Elec. Eng.	98
98988	Tanaka	Biology	120

Assignment 3

Q2 –Write SQL codes to get a list of;

- ii) list of instructors:

Enter SQL commands here

```
1 select name from instructor-- enter your commands here
```

Execute

Save the db

Load an SQLite database file: Choose File No file chosen

name
Srinivasan
Wu
Mozart
Einstein
El Said
Gold
Katz
Califieri
Singh
Crick
Brandt
Kim

Assignment 3

Q2 –Write SQL codes to get a list of;

ii) List of instructors with ID

Enter SQL commands here

```
1 select ID, name from instructor-- enter your commands here
```

Execute

Save the db

Load an SQLite database file:

Choose File

No file chosen

ID	name
10101	Srinivasan
12121	Wu
15151	Mozart
22222	Einstein
32343	El Said
33456	Gold
45565	Katz
58583	Califieri
76543	Singh
76766	Crick
83821	Brandt
98345	Kim

Assignment 3

Q2 –Write SQL codes to get a list of;

ii) List of instructors with ID, dept name, and salary

Enter SQL commands here

```
1 select * from instructor;-- enter your commands here
```

Execute

Save the db

Load an SQLite database file:

Choose File

No file chosen

ID	name	dept_name	salary
10101	Srinivasan	Comp. Sci.	65000
12121	Wu	Finance	90000
15151	Mozart	Music	40000
22222	Einstein	Physics	95000
32343	El Said	History	60000
33456	Gold	Physics	87000
45565	Katz	Comp. Sci.	75000
58583	Califieri	History	62000
76543	Singh	Finance	80000
76766	Crick	Biology	72000
83821	Brandt	Comp. Sci.	92000
98345	Kim	Elec. Eng.	80000

Assignment 3

Q2 –Write SQL codes to get a list of;

iii) List of departments

Enter SQL commands here

```
1 select dept_name from department-- enter your commands here
```

Execute

Save the db

Load an SQLite database file: Choose File No file chosen

dept_name
Biology
Comp. Sci.
Elec. Eng.
Finance
History
Music
Physics

Assignment 3

Q2 –Write SQL codes to get a list of;

iii) All attributes of the department

Enter SQL commands here

```
1 select * from department;-- enter your commands here
```

Execute

Save the db

Load an SQLite database file:

Choose File

No file chosen

dept_name	building	budget
Biology	Watson	90000
Comp. Sci.	Taylor	100000
Elec. Eng.	Taylor	85000
Finance	Painter	120000
History	Painter	50000
Music	Packard	80000
Physics	Watson	70000

Assignment 3

Q3

Q3.i) find the ID and name of each student who has taken at least 1 comp sci course, make sure there are no duplicate names.

Enter SQL commands here

```
1 SELECT DISTINCT s.ID, s.name
2 FROM student s
3 JOIN takes t ON s.ID = t.ID
4 JOIN course c ON t.course_id = c.course_id
5 WHERE c.dept_name = 'Comp. Sci.';
```

Execute

Save the db

Load an SQLite database file: No file chosen

ID	name
00128	Zhang
12345	Shankar
45678	Levy
54321	Williams
76543	Brown
98765	Bourikas

Assignment 3

Q3

Q3.ii) Add grades to the list

Enter SQL commands here

```
1 SELECT DISTINCT s.ID, s.name, t.grade
2 FROM student s
3 JOIN takes t ON s.ID = t.ID
4 JOIN course c ON t.course_id = c.course_id
5 WHERE c.dept_name = 'Comp. Sci.';
```

Execute

Save the db

Load an SQLite database file: No file chosen

ID	name	grade
00128	Zhang	A
00128	Zhang	A-
12345	Shankar	C
12345	Shankar	A
45678	Levy	F
45678	Levy	B+
45678	Levy	B
54321	Williams	A-
54321	Williams	B+
76543	Brown	A
98765	Bourikas	C-
98765	Bourikas	B

Assignment 3

Q3

Q3.iii) Find the name and ID of each student who has not taken any course offered before 2017

Enter SQL commands here

```
1 SELECT s.ID, s.name
2 FROM student s
3 WHERE NOT EXISTS (SELECT 1 FROM takes t JOIN section sec ON t.course_id = sec.course_id WHERE s.ID = t.ID AND sec.year < 2017);
```

Execute

Save the db

Load an SQLite database file:

Choose File

No file chosen

ID	name
00128	Zhang
12345	Shankar
19991	Brandt
23121	Chavez
44553	Peltier
45678	Levy
54321	Williams
55739	Sanchez
70557	Snow
76543	Brown
76653	Aoi
98765	Bourikas
98988	Tanaka

Assignment 3

Q3

Q3.iv) for each department, find the maximum salary of instructors in that department. Assume that each dept has at least 1 instructor.

Enter SQL commands here

```
1 SELECT d.dept_name, MAX(i.salary) as max_salary
2 FROM department d
3 JOIN instructor i ON d.dept_name = i.dept_name
4 GROUP BY d.dept_name;
```

Execute

Save the db

Load an SQLite database file: No file chosen

dept_name	max_salary
Biology	72000
Comp. Sci.	92000
Elec. Eng.	80000
Finance	90000
History	62000
Music	40000
Physics	95000

Assignment 3

Q3

Q3.v) Find the lowest , across all departments, of the per-department salary computed by the preceding query

Enter SQL commands here

```
1 SELECT MIN(max_salary) as lowest_max_salary
2 FROM (SELECT MAX(i.salary) as max_salary FROM instructor i GROUP BY i.dept_name) as max_salaries;
```

Execute

Save the db

Load an SQLite database file: No file chosen

lowest_max_salary
40000

Assignment 3

Q3

Q3.vi) Add names to the list.

Enter SQL commands here

```
1 SELECT d.dept_name, i.name, i.salary as max_salary
2 FROM (
3     SELECT dept_name, MAX(salary) as max_salary
4     FROM instructor
5     GROUP BY dept_name
6 ) as max_salaries
7 JOIN instructor i ON max_salaries.dept_name = i.dept_name AND max_salaries.max_salary
8 JOIN department d ON i.dept_name = d.dept_name
9 ORDER BY d.dept_name;
```

Execute

Save the db

Load an SQLite database file: No file chosen

dept_name	name	max_salary
Biology	Crick	72000
Comp. Sci.	Brandt	92000
Comp. Sci.	Katz	75000
Comp. Sci.	Srinivasan	65000
Elec. Eng.	Kim	80000
Finance	Singh	80000
Finance	Wu	90000
History	Califieri	62000
History	El Said	60000
Music	Mozart	40000
Physics	Einstein	95000
Physics	Gold	87000

Assignment 3

Q4

Q4. Find instructor (with name and ID) who has never given an A grade in any course she or he has taught. (Instructors who have never taught a course trivially

Enter SQL commands here

```
1 SELECT i.ID, i.name
2 FROM instructor i
3 WHERE NOT EXISTS (
4     SELECT 1
5     FROM teaches t
6     JOIN takes tk ON t.course_id = tk.course_id
7     WHERE i.ID = t.ID AND tk.grade = 'A'
8 );
```

Execute

Save the db

Load an SQLite database file:

Choose File

No file chosen

ID	name
12121	Wu
15151	Mozart
22222	Einstein
32343	El Said
33456	Gold
58583	Califieri
76543	Singh
98345	Kim

