

CS2102 Database Systems

Semester 1 2019/2020

Tutorial 02

Quiz

- Let $v = \text{null}$, $x = 10$, $y = 20$, and $z = 30$. What is the result of each expression below?
 - $x + y = z$
 - $v + x = z$
 - $x + z <> y$
 - $x < y$
 - $v < x \text{ AND } y < z$
 - $v < x \text{ OR } y < z$
 - $\text{IS NULL } v$
 - $\text{IS NULL } v + x + y + z$
 - $v + y = y + v$
 - $v + y <> y + v$
 - $v + y \text{ IS DISTINCT FROM } y + v$
- Consider the following table creation `CREATE TABLE emptiness ();` can you insert any value into the table?
- Consider the following relation instance X as well as the table Y created as below:

X	
<u>a</u>	<u>b</u>
1	2
1	3
2	1
3	2

```
CREATE TABLE Y (  
  c integer,  
  d integer,  
  FOREIGN KEY (c,d) REFERENCES X(a,b)  
);
```

Which of the following operations will fail?

- Inserting (2, 3) into Y
 - Inserting (1, 2) into Y
 - Inserting (1, 3) into Y
 - Inserting (3, 1) into Y
 - Inserting (null, 4) into Y
 - Inserting (4, null) into Y
- What is the content of the table Y after all the operations above have been run in sequence, ignoring any failed operations?
 - Consider the two tables T1 and T2 below:

```
CREATE TABLE T1 (  
  a integer PRIMARY KEY,  
  b integer  
);
```

```
CREATE TABLE T2 (  
  a integer REFERENCES T1,  
  b integer PRIMARY KEY  
);
```

Write a sequence of operations such that at the end of execution of your operations, the content of the two tables will be as shown below:

T1	
<u>a</u>	<u>b</u>
1	2

T2	
<u>a</u>	<u>b</u>
1	2

- Consider Question 5 above, but table T1 is created differently as follows (assume that it can, since you have not yet taught `ALTER TABLE`):

```
CREATE TABLE T1 (  
  a integer PRIMARY KEY,  
  b integer REFERENCES T2  
);
```

Now note the circular references. Can you still solve Question 5 given this additional constraint?

Tutorial Questions*[Discussion: 7, 8]*

7. Consider a relational database consisting of the following two tables:

- `Offices (officeID, building, level, roomNumber, area)`
- `Employees (empID, name, officeID, managerID)`

The database satisfies the following constraints:

- `officeID` is the primary key of `Offices`
- `{building, level, roomNumber}` is a candidate key of `Offices`
- `empID` is the primary key of `Employees`
- The name of each employee must be a non-null value
- Each employee must be assigned to exactly one office identified by `officeID`
- Each employee may be managed by at most one manager
- If an employee is managed by someone, the `empID` of the manager is recorded in `managerID`

Write SQL statements, to create the database schema with appropriate attribute domains and constraints.

8. Consider the following relational database, where the primary key of each table is shown underlined:

- `Students (sid, mentee, grade)`

A tuple `(1, 2, 4.5)` indicates that the student with ID 1 is mentoring another student with ID 2 and the student with ID 1 has a grade of 4.5. A tuple `(1, null, 3.0)` indicates the student with ID 1 is not mentoring other students. The database has to satisfy the following additional constraints:

- `Student.mentee` is a foreign key that references `Student(sid)`
- A student can only be mentoring another student if his/her grade is greater than or equal to 4.0
- A given student may not mentor himself/herself

Write SQL statements, to create the database schema with appropriate attribute domains and constraints.

9. Consider the following relational database, with one table, created as follows:

```
CREATE TABLE Cars (
  plateNum integer PRIMARY KEY,
  company varchar(100) NOT NULL,
  type integer NOT NULL,
  model varchar(5) NOT NULL,
  capacity integer,
  UNIQUE (company, type),
  UNIQUE (type, model, capacity),
  UNIQUE (plateNum, model)
);
```

Given the table created as above, list down all the possible candidate keys of the table.