

2 Databases (tgg22)

Suppose we have a relational database with three tables

table	key attributes
S(sid, A)	sid
T(tid, B)	tid
R(sid, tid, C)	sid, tid, C

The following referential integrity constraints hold on the table R. Every `sid`-value in R is the key of a record in table S and `tid`-value in R is the key of a record in table T.

- (a) What does it mean that the attribute C is included in R's key? [2 marks]
- (b) Write an SQL query to return records of the form `sid` where `sid` is the key of an S record that is not R-related to any records in table T. [2 marks]
- (c) Consider the following two queries.

```
Q1 = SELECT S1.A AS A, R1.C AS C
      FROM R AS R1
      JOIN R AS R2 ON R2.tid = R1.tid
      JOIN S AS S1 ON S1.sid = R1.sid
      JOIN S AS S2 ON S2.sid = R2.sid
```

and

```
Q2 = SELECT DISTINCT S1.A AS A, R1.C AS C
      FROM R AS R1
      JOIN R AS R2 ON R2.tid = R1.tid
      JOIN S AS S1 ON S1.sid = R1.sid
      JOIN S AS S2 ON S2.sid = R2.sid
```

Note that the only difference is the use of `DISTINCT` in Q2.

- (i) If Q1 and Q2 return the same results, what can you conclude about the data in this database? Justify your answer. [4 marks]
- (ii) Suppose we add this where-clause to each query:

```
WHERE R1.C = R2.C AND S1.sid <> S2.sid
```

If the modified Q1 and Q2 return the same results, what can you conclude about the data in this database? Justify your answer. [4 marks]

- (iii) Suppose we add the where-clause `WHERE R1.tid <> R2.tid` to each query. If the modified Q1 and Q2 return the same results, what can you conclude about the data in this database? Justify your answer. [4 marks]
- (iv) Suppose we add this where-clause to each query:

```
WHERE R1.tid <> R2.tid AND S1.sid <> S2.sid
```

If the modified Q1 and Q2 return the same results, what can you conclude about the data in this database? Justify your answer. [4 marks]