Database Management Systems [CSE2007 - 142]

Marks: 50 **Duration: 90 mins.**

A

Answer all the questions.

1) **Consider the following relations with the condition that a person can live in and own multiple houses:** (2)

a) **HOUSE(house-id, h-address, h-age),**
PERSON(person-id, p-name, p-age),
OWNS(house-id, person-id),
LIVES-IN(house-id, person-id)},

Write SQL queries for the following tasks.
Find the names of persons who are either part or full owner of at least one of the houses in which they live.

b) **Find the name of the person who owns the most houses.** (2)

c) **Find the names of the persons who do not live anywhere.** (3)

d) **Find the names of all persons who live in a house which is the same age as the person's age.** (3)

2) **Consider the relational schemas Student(S_id,S_name), Course(C_id,C_name), and Enrolls(S_id, C_id).** (5)

a) **Write down an SQL query that returns, for each student present in the database, the student identity S_id and the number of courses she/he is enrolled in. This may mean that for some values of S_id the count is 0.**

b) **Write down an SQL query that returns all pairs of students (S_id_1; S_id_2) such that S_id_1 has taken (at least) all the courses that S_id_2 has taken.** (5)

3) **Consider the relation R(A B C D E F G) with the following set of functional dependencies:** (4)

a) **AD → F, AE → G, DF → BC, E → C, G → E**
List all the candidate keys (not superkeys).

b) **Consider the decomposition of relation R into 4 relations: R1(ADF), R2(CE), R3(EG), and R4(ABDG). What is the highest normal form of this decomposition? Is this decomposition dependency preserving? Is it lossless? Justify your answer.** (6)

4) **The following functional dependencies hold for relations R(A,B,C) and S(B,D,E): B → A, and A → C. The relation R contains 200 tuples and the** (3)

a) **relation S contains 100 tuples. What is the maximum number of tuples possible in the natural join R ⋈ S? Explain.**

b) **Following is the set of functional dependencies on the relational schema (P,Q,R):** (3)
P-->QR, PQ-->R, Q-->R, P-->Q
Find it's minimal cover.

c) **Consider the following two set of functional dependencies:** (4)
F = { A → B, AB → C, D → AC, D → E } and G ={ A → BC, D → AB}
Are they equivalent to one another? Justify.

5) **Consider the following SQL query on the given set of schemas:** (5)
Student (sid, name, age, address)

a) **Book(bid, title, author)**
Checkout(sid, bid, date)

```
SELECT S.nameFROM Student S, Book B, Checkout C
WHERE S.sid = C.sid AND B.bid = C.bid AND
B.author = 'Olden Fames' AND S.age > 12 AND S.age < 20
```

Show an expression tree for this query, assuming there are no indexes and data is not sorted on any attribute.

b) **Consider the following SQL query on the schema branch(branch_name, branch_city,assets):** (5)

select t.branch_namefrom branch t, branch swhere t.assets > s.assets and s.branch_city = 'Burnaby';

Write an efficient relational algebra expression that is equivalent to this query and JUSTIFY your choice with an explanation.

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