THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

# The University of Queensland

## School of Information Technology and Electrical Engineering

## INFS1200/7900 Quiz 2

Name: _____ Student #: _____

Signature: _____

**Notes about this examination**

1. You have **10 minutes** reading time and **90 minutes** to write this examination.
2. You may use a pencil to write your solutions.
3. Answer all the questions on this paper.
4. The marks for each question are given in [].
5. Good luck!

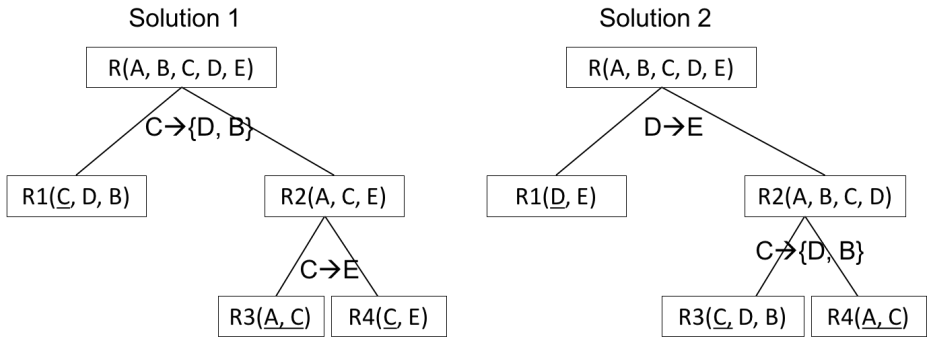
| Question | Mark | Max |
|---|---|---|
| Q1 | | 10 |
| Q2 | | 15 |
| Q3 | | 15 |
| Q4 | | 15 |
| Q5 | | 15 |
| **Total** | | **70** |

Q1 **[10 marks]** Answer the following questions.
Q1A. **[5 marks]** Suppose you are given a relation R (A, B, C, D, E) with the following functional dependencies:

{A, B}→C, C→{D, B}, D→E

Is R in BCNF? If not, decompose this relation into BCNF using the algorithm we covered in class and in the book; circle all answers in your final decomposition. Show all your work.

{A, B}→C,
C→{D, B}
D→E
Implicit: C→D
Key: {A, B}, {A, C}

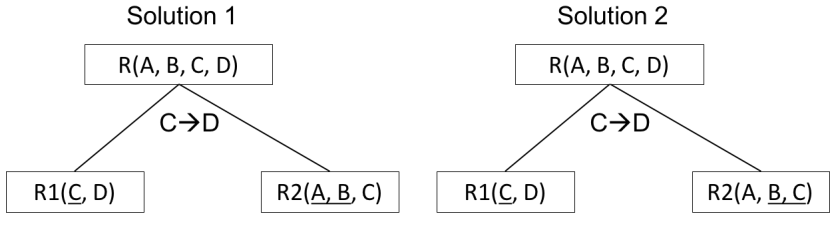



Q1B. **[5 marks]** Suppose you are given a relation R (A, B, C, D) with the following functional dependencies:

A→C, {B, C}→A, C→D

Is R in 3NF? If not, decompose this relation into 3NF using the algorithm we covered in class and in the book; circle all answers in your final decomposition. Show all your work.

A→C,
{B, C}→A
C→D
Key: {A, B}, {B, C}
Prime attributes: A, B, C



The rest of the questions on this quiz are related to the database schema and database instance found in Appendix A. Please review it carefully and answer all of the following questions. For each query remove duplicates from your final answers where they are not explicitly requested, and include no extra columns).

2. **[15 marks]** Write the following SQL queries **without using subqueries**.

2A. **[4 marks]** Find the name of the breeds that have more than 2 pets.

Query

```
SELECT Breed
FROM Pet
GROUP BY Breed
HAVING COUNT(*) >2
```

2B. **[5 marks]** Assuming the intersect operator is not implemented, find those clients who adopted a pet before 2016 and after 2017. Show the result of your query using data from Appendix A.

Query

```
SELECT DISTINCT(A1.ClientID)
FROM ADOPTION A1, ADOPTION A2
WHERE A1.ClientID = A2.ClientID
AND A1.`Date` < "2016-01-01"
AND A2.`Date` > "2017-12-31"
```

Do we want to select * from client or happy with this?

Result

| ClientID |
|---|
| 1 |

2C. **[6 marks]** For each breed that has been adopted**,** find the number of times they have been adopted. Show the result of your query using data from Appendix A.

Query

```
SELECT Breed, COUNT(*)
FROM PET P, ADOPTION A
WHERE P.ID = A.PetID
GROUP BY Breed
```

Result

| **Breed** | **Count** |
|---|---|
| Siamese | 2 |
| Lorikeet | 1 |
| Border Collie | 1 |
| Labrador | 1 |

3. **[15 marks]** Write the following SQL queries **using at least one subquery**. Show the result of your query using data from Appendix A.

3A. **[4 marks]** Find the breeds of pet which have never been adopted. Show the result of your query using data from Appendix A.

| Query | Result |
|---|---|
| `SELECT Name`<br>`FROM BREED`<br>`WHERE Name NOT IN (SELECT BREED`<br>`  FROM PET`<br>`  WHERE ID IN (SELECT PetID`<br>`  FROM ADOPTION))` | None |

3B. **[5 marks]** Find the ID of the client(s) who adopted the most pets.

| Query | Result |
|---|---|
| `SELECT ClientID`<br>`FROM ADOPTION`<br>`GROUP BY ClientID`<br>`HAVING COUNT(*) >= ALL (SELECT COUNT(*)`<br>`  FROM ADOPTION`<br>`  GROUP BY ClientID)` | ClientID<br>1<br>4 |

3C. **[6 marks]** Find owners with at least two pets, where one of the pets is a dog.

| Query | Result |
|---|---|
| `SELECT ClientID`<br>`FROM ADOPTION`<br>`WHERE ClientID IN (SELECT ClientID`<br>`  FROM ADOPTION A, PET P, BREED B`<br>`  WHERE A.PetID = P.ID`<br>`  AND P.Breed = B.Name`<br>`  AND B.Species = "Dog")`<br>`GROUP BY ClientID`<br>`HAVING COUNT(*) >=2` | ClientID<br>1 |

4. **[15 marks]** Write the following SQL queries. You can use any of the operators taught in the lectures.

4A. **[7 marks]** Find the clients that have not adopted any of the breeds that Dwight Schrute has adopted.

Query

```
SELECT *
FROM CLIENT
WHERE ClientID NOT IN (
    SELECT ClientID
    FROM PET P, ADOPTION A1
    WHERE P.ID = A1.PetID
    AND Breed IN (SELECT Breed
        FROM PET P, ADOPTION A2, CLIENT C
        WHERE P.ID = A2.PetID
        AND C.ID = A2.ClientID
        AND C.Name = "Dwight Schrute")


SELECT *
FROM CLIENT X
WHERE NOT EXISTS (SELECT *
    FROM ADOPTION A1, PET P, CLIENT C
    WHERE A1.PetID = P.ID
    AND A1.ClientID = C.ID
    AND C.Name = "Dwight Schrute"
    AND P.Breed IN (SELECT Breed
        FROM ADOPTION A2, PET P
        WHERE A.PetID = P.ID
        AND X.ClientID = A2.ClientID))
```

Result

| ID | Name | Etc. |
|---|---|---|
| 1 | John Smith | |
| 2 | Oscar Grouch | |

4B. **[8 marks]** Find the clients who have adopted all the breeds that Hermione Granger adopted.

Query

```
SELECT *
FROM CLIENT X
WHERE NOT EXISTS (SELECT *
    FROM ADOPTION A1, PET P, CLIENT C
    WHERE A1.PetID = P.ID
    AND A1.ClientID = C.ID
    AND C.Name = "Hermione Granger"
    AND P.Breed NOT IN (SELECT Breed
        FROM ADOPTION A2, PET P
        WHERE A2.PetID = P.ID
        AND X.ID = A2.ClientID))

Can remove Hermione from query if
they want (Optional)
```

Result

| ID | Name | Etc. |
|---|---|---|
| 3 | Hermione | |
| 4 | Dwight | |

5. **[15 marks]** The following questions are related to modifying data and integrity constraints.

5A. **[3 marks]** Delete all adoptions made by John Smith from the Adoption Table.

Query

```
DELETE FROM Adoption
WHERE ClientID IN (SELECT ID
   FROM CLIENT
   WHERE Name = "John Smith")
```

5B. **[3 marks]** Modify the popularity column of the breed column such that the ratings are now on a scale 1-5 instead of 1-10. Eg. A rating of 8 should become a rating of 4.

Query

```
UPDATE BREED
SET Popularity = Popularity/2
```

5C. **[4 marks]** Write the SQL statement to create the PET table. Assume the BREED table has already been created.

Query

```
CREATE TABLE PET (
   ID INT,
   Name VARCHAR(30),
   Breed VARCHAR(30),
   Age INT,
   Sex VARCHAR OR ENUM
   PRIMARY KEY(ID),
   FOREIGN KEY(Breed) REFERENCES BREED(Name)
)
```

5D. **[5 marks]** Can we delete the pet with ID=4 from the PET table – Why or Why not?

Query

Yes – it is not referenced in the adoption table

**This space is intentionally left blank. You can use it to answer questions or as scratch paper**

(if you use this, CLEARLY indicate the connection between this work and the problem it is for both here and where the problem is stated!)