COIT20247 - Database Design & Development

Tutorial – Logical design (Normalisation)

Theory questions

Answer each of the questions below. You should be able to answer most of these questions within about 3 to 5 sentences. Refer to the lecture slides to find the important points about each of these questions. **Note:** if you are completing this tutorial sheet in a scheduled tutorial, it would be wise **to attempt the practical question firsts**.

1. Describe what is meant by **well-structured relation**.

2. Define what is meant by:
   a. **First normal form**
   b. **Second normal form**
   c. **Third normal form**
   d. **Boyce-codd normal form**
   e. **Fourth normal form**

3. Define what is meant by a **functional dependency**. Use an example to explain your answer.

4. Define what is meant by a **partial dependency.**

5. Define what is meant by a **transitive dependency**.

6. Define what is meant by a **multi-valued dependency**.

Practical questions

7. The relation below describes courses taught at a university, together with the ID and name of the lecturer who teaches the course. Each course is identified by a CourseID and has one name and one CreditPoints. The only candidate key is CourseID. Using this relation, describe what is meant by **insertion anomaly, deletion anomaly,** and **modification anomaly.**

CourseID	CourseName	CreditPoints	LecturerID	LecturerName
COIT12167	Database Use & Design	6	2	Marsha Jones
COIS20007	Industry development	8	3	John Smith
COIS20024	Systems development overview	8	1	Rose Tyler
COIS20025	Systems Mgt Overview	8	2	Marsha Jones
COIS20026	Database Dev & Mgt	8	3	John Smith

8. What functional dependencies are present in the relation given in the previous question?

9. What normal form is the relation (given above) in? Hint:
   a. Does it *satisfy* the requirements of 1NF? Why?
   b. Does it *satisfy* the requirements of 2NF? Why?
   c. Does it *satisfy* the requirements of 3NF? Why?
   d. Which normal form does it *fail* and what is the highest normal form that it *satisfies*?

10. Convert this relation into two or more relations that satisfy 3NF.

11. The relation below describes students at a university and the campus at which they study. Each student is identified by a StudentID. The only candidate key is StudentID. Describe what **insertion, deletion** and **modification anomalies** will occur with this relation.

StudentID	StudentName	DateOfBirth	CampusID	Campus
S0000001	Rakesh Singh	5/5/1985	1	Brisbane
S0000002	Bruce Li	4/9/1978	3	Melbourne
S0000003	Eric Jones	21/11/1990	2	Gold Coast
S0000004	Donna Noble	5/5/1985	4	Sydney
S0000005	Simmi Chiou	18/7/1991	3	Melbourne

12. What functional dependencies are present in the relation given in the previous question?

13. What is the highest normal form satisfied by the relation above? Justify your answer.

14. The relation below describes grades achieved by students in courses. Each student in each course receives one grade. There is only one candidate key: (StudentID, CourseID). Describe what **insertion, deletion** and **modification anomalies** will occur with this relation.

StudentID	CourseID	Grade	CourseName
S0000001	COIS20026	C	Database Dev & Mgt
S0000001	COIS20025	D	Systems development overview
S0000002	COIS20026	HD	Database Dev & Mgt
S0000003	COIS20007	P	Industry development
S0000003	COIS20026	D	Database Dev & Mgt
S0000004	COIS20025	HD	Systems development overview
S0000004	COIS20026	P	Database Dev & Mgt

15. What functional dependencies are present in this relation?

16. What is the highest normal form satisfied by this relation? Justify your answer.

17. Given the following functional dependencies:

    StudentID $\rightarrow$ StudentName
    StudentID $\rightarrow$ DateOfBirth

    Is it acceptable to write the following:

    StudentID $\rightarrow$ StudentName, DateOfBirth

    Why or why not?

18. Given the following functional dependencies:

    SupplierID $\rightarrow$ SupplierPhone
    SupplierName $\rightarrow$ SupplierPhone

    Is it acceptable to write:

    SupplierID, SupplierName $\rightarrow$ SupplierPhone

    Why or why not?