

Assignment 4 – Week 5

This assignment is based on lecture 5 (chapter 14).

- Submit your *own work* on time. No credit will be given if the assignment is submitted after the due date.
 - Note that the completed assignment should be submitted in .doc, .docx, .rtf or .pdf format only.
 - In MCQs, if you think that your answer needs more explanation to get credit then please write it down.
 - You are encouraged to discuss these questions in the Sakai forum.
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- (1) Every time attribute A appears, it is matched with the same value of attribute B, but not the same value of attribute C. Therefore, it is true that:
- A. **$A \rightarrow B$**
 - B. $A \rightarrow C$
 - C. $A \rightarrow (B, C)$
 - D. $(B, C) \rightarrow A$
- (2) A table is in 2NF if the table is in 1NF and what other condition is met?
- A. There are no functional dependencies.
 - B. There are no null values in primary key fields.
 - C. **There are no repeating groups.**
 - D. There are no attributes that are not functionally dependent on the relation's primary key.
- (3) Consider a relation : EmpData(empcode, name, street, city, state, pincode)
For any pincode, there is only one city and state. Also, for given street, city and state, there is just one pincode. In normalization terms, EmpData is a relation in
- A. 1 NF only
 - B. **2 NF and hence also in 1 NF**
 - C. 3NF and hence also in 2NF and 1NF
 - D. None of the above
- (4) Consider a relation $R = (A, B, C, D)$ with the following FDs:
 $AB \rightarrow C$, $C \rightarrow D$, and $D \rightarrow A$
(a) List all candidate keys of R.
ANS:
(A, B), (B, C), (B, D)
(b) Is R in 3NF?
ANS:
yes
- (5) Consider a relation $R = (A, B, C, D)$ with the following FDs:
 $A \rightarrow B$, $A \rightarrow C$, $A \rightarrow D$, $C \rightarrow B$ and $C \rightarrow D$
Is there any transitive dependency? If yes, then how to get rid of it?
 $A \rightarrow C$, $C \rightarrow D$

- (6) Describe the types of update anomalies that may occur in a relation that has redundant data. (Review question 14.3 from the book)
A major aim of relational database design is to group attributes into relations so as to minimize information redundancy and thereby reduce the file storage space required by the base relations. Another serious difficulty using relations that have redundant information is the problem of update anomalies. These can be classified as insertion, deletion, or modification anomalies
- (7) Describe the concept of full functional dependency and describe how this concept relates to 2NF. Provide an example to illustrate your answer. (Review question 14.10 from the book)
Full functional dependency Indicates that if A and B are attributes of a relation, B is fully functionally dependent on A if B is functionally dependent on A, but not on any proper subset of A. Second Normal Form (2NF) is a relation that is in first normal form and every non-primary-key attribute is fully functionally dependent on the primary key
- (8) Describe the concept of transitive dependency and describe how this concept relates to 3NF. Provide an example to illustrate your answer. (Review question 14.11 from the book)
Transitive dependency A condition where A, B, and C are attributes of a relation such that if $A \rightarrow B$ and $B \rightarrow C$, then C is transitively dependent on A via B (provided that A is not functionally dependent on B or C) Third Normal Form (3NF) is a relation that is in first and second normal form in which no non- primary-key attribute is transitively dependent on the primary key.
- (9) Solve exercise 14.14 (a, b, c) on page 390 from the course text book (5th edition). For the 4th edition users, the question is 13.14 (a,b,c)
(a) Identify the functional dependencies represented by the attributes shown in the form in Figure 14.18. State any assumptions that you make about the data and the attributes shown in this form.

Description and the name of drug are unique

Patient_number , Ward_number => bed_number , Full_name , ward_name

Drug_Number , Unit_per_day , start_date , finish_date => Name , Description , Dosage , Method_of_Admin

Name , Unit_per_day , start_date , finish_date => Drug_Number , Description , Dosage , Method_of_Admin

Description, Unit_per_day , start_date , finish_date => Drug_Number , Name , Dosage , Method_of_Admin

(b) ANS:

Describe and illustrate the process of normalizing the attributes shown in Figure 14.18 to produce a set of well-designed 3NF relations.

- 1NF : we will eliminate all the repeated group in unnormalized.
- 2NF :we will now create a new table based on partial dependency :

Partial dependency :

Patient_number => Full_name

Ward_number => ward_name

Drug_Number => Name , Description ,Dosage , Method_of_Admin

Name => Drug_Number , Description ,Dosage , Method_of_Admin

Description => Drug_Number , Name,Dosage , Method_of_Admin

So we will have

Table: Patient

Columns: patient_number, full_name

Table: Ward

Columns: ward_number, ward_name

Table: Patient_ward

Columns: patient_number, ward_number, bed_number

Table: Drug

Columns; drug_number, name, description, dosage, method_of_admin

Table: Drug_use

Columns: drug_number, units_per_day, start_date, finish_date

3NF : We are already in 3NF , because there is no transitive dependency in our database .

(c) ANS: Identify the primary, alternate, and foreign keys in your 3NF relations.

* Primary Key :

Patient : patient_Number

Ward : ward_number

Drug : Drug_Number

Patient_ward table : (patient_Number , ward_number)

Drug_use table : (Drug_Number , units_per_day , start_date , finish_date)

Foreign_Key : No foreign key in this database .

(10) Solve exercise 14.15 (a, b, c) on page 391 from the course text book (5th edition).

For the 4th edition users, the question is 13.15 (a,b,c)

(a) ANS:

update anomalies :

when we execute update :

update table_1 set the staffNo='S2000' where patNo='P100'

we will have 2 StaffNo for the same dentistName which is not correct .

insert anomalies :

we can insert patNo with a null staffNo which violate entity integrity

Delete Anomalies :

If we delete PatNo from the table , we will lose the information of the corresponding Dentist_Name .

(b) ANS:

We assume that the names of dentist and patient are not unique.

(PatNo , StaffNo , appointment_date_time ,SurgeryNo) -----> patName, dentistName

(c) ANS:

Our database is already in 1NF that means no group of value in all attribute

1NF -> 2NF

We have a partial dependency :

PatNo--->PatName

So we will create a new table named : Patient

We have a partial dependency :

StaffNo--->dentistName

So we will create a new table named : Staff

2NF is :

Table: Patient

Columns: patNo, patName

Table: Staff

Columns: staffNo, dentistName