**Database Management System – cs422 DE**

**Assignment 4 – Week 5**

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**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.

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:
2. A 🡪 B
3. A 🡪 C
4. A 🡪 (B, C)
5. (B,C) 🡪 A

ANS:

A

1. A table is in 2NF if the table is in 1NF and what other condition is met?
2. There are no functional dependencies.
3. There are no null values in primary key fields.
4. There are no repeating groups.
5. There are no attributes that are not functionally dependent on the relation's primary key.

ANS:

C

1. 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
   1. 1 NF only
   2. 2 NF and hence also in 1 NF
   3. 3NF and hence also in 2NF and 1NF
   4. None of the above

ANS:

B

1. Consider a relation R = (A,B,C,D) with the following FDs:  
   AB 🡪 C, C 🡪 D, and D 🡪 A  
   (a) List all candidate keys of R.  
   ANS:   
   (A, B), (B, C), (B, D)

(b) Is R in 3NF?  
ANS:

Yes

1. Consider a relation R = (A,B,C,D) with the following FDs:  
   A 🡪 B, A 🡪 C, A 🡪 D, C 🡪 B and C 🡪 D  
   Is there any transitive dependency? If yes, then how to get rid of it?

ANS:

Yes

A 🡪 C and C 🡪 D for example

We need to create 2 new tables to eliminate the transitive dependency

1. Describe the types of update anomalies that may occur in a relation that has redundant data. (Review question 14.3 from the book)

ANS:

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

1. 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)

ANS:

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

1. 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)

ANS:

Transitive dependency A condition where A, B, and C are attributes of a relation such that if A ->B and B -> 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.

1. 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)
2. ANS:
3. **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.**

We assume that the 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

1. ANS:

**(b) 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 ; so we are already in

1NF .

* 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

**Patient table :**

|  |  |
| --- | --- |
| Patient\_number | Full\_name |

**Ward table :**

|  |  |
| --- | --- |
| War\_number | Ward\_name |

**Patient\_ward table :**

|  |  |  |
| --- | --- | --- |
| Patient\_number | War\_number | Bed\_number |

**Drug table :**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Drug\_Number | Name | Description | Dosage | Method\_of\_admin |

**Drug\_use table :**

|  |  |  |  |
| --- | --- | --- | --- |
| Drug\_Number | units\_per\_day | Start\_date | Finish\_date |

**3NF :** we need to create a new tables for all attribute which have a transitive dependency **.**

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

1. ANS:
2. 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 )

\*Alternate Key : if we assume that the Name and description are unique

Drug table : Name , Description

* Foreign\_Key : No foreign key in this database .

1. 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)
2. ANS:

**update anomalies :**

when we execute update :

update table\_1 set the staffNo=’S2000’ where patNo=’P100’

we will have 2 SatffNo 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 .

1. ANS:

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

(PatNo , StaffNo , appointement\_date\_time ,SurgeryNo ) --------> patName, dentistName

1. ANS:

Our databsa is already in 1NF thas mean 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--->dentisteName

So we will create a new table named : Staff

2NF is :

Patient:

|  |  |
| --- | --- |
| PatNo | PatName |

Staff:

|  |  |
| --- | --- |
| StaffNo | dentistName |

Table\_1 :

|  |  |  |  |
| --- | --- | --- | --- |
| satffNo | PatNo | Appointement\_date\_time | SurgeryNo |
|  |  |  |  |

2NF-🡪 3NF :

There is no transitive dependency so we are already in 3NF

3NF=2NF