# Directions & Deliverable (14.28 pts ea) – Tim Capehart

Complete the following exercises in a single document. Label each question and/or letter clearly. Submit your work electronically to Blackboard by the due date specified.

1. Examine the Patient Medication Form for the Wellmeadows Hospital case study shown below.

A screenshot of a cell phone

Description generated with very high confidence

(a) Identify the functional dependencies represented by the data shown in the figure above.

Patient full name and bed number are dependent on patient number. The Ward Name is dependent on the Ward Number. All of the drug columns are dependent on the drug number.

(b) Describe and illustrate the process of normalizing the data shown in the figure above to First (1NF), Second (2NF), and Third (3NF).

1NF: first divide into 2 tables; one with patient info and ward info, and the other with the drug info.

2NF: further separate the table with patient and ward info into 2 tables: one for Patient, one for Ward.

3NF: The 2NF is the same as 3NF because each field in the table is now only dependent on its own ID.

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

Patient Table: PK 🡪 Patient Number, FK 🡪 Ward Number

Ward Table: PK 🡪 Ward Number

Drug Table: PK 🡪 Drug Number, FK 🡪 Patient Number

1. The table shown below lists dentist/patient appointment data. A patient is given an appointment at a specific time and date with a dentist located at a particular surgery. On each day of patient appointments, a dentist is allocated to a specific surgery for that day.

A screenshot of a cell phone

Description generated with very high confidence

(a) The table shown above is susceptible to update anomalies. Provide examples of insertion, deletion, and update anomalies.

On an insertion, a dentist could get assigned to an additional surgery or confilicting appointment date/time. On a deletion, you would delete the appointment details along with the dentist information. On an update, the appointment times could conflict with another appointment.

(b) Describe and illustrate the process of normalizing the table shown above to 3NF. State any assumptions you make about the data shown in this table.

First, separate the table into 2 tables, one with staff and patients and one with appointments / surgery numbers. Then, further separate the staff and patients into 2 tables:

Staff Table: PK\_staffNo, dentistName;

Patient Table: PK\_patNo, patName;

Surgery Table: PK\_surgeryNo, appointment date/time, FK\_staffNo, FK\_patNo

1. An agency called Instant Cover supplies part-time/temporary staff to hotels within Scotland. The table shown below lists the time spent by agency staff working at various hotels. The National Insurance Number (NIN) is unique for every member of staff.

A screenshot of a cell phone

Description generated with very high confidence

(a) Thetable shown above is susceptible to update anomalies. Provide examples of insertion, deletion, and update anomalies.

Inserting an employee requires a contract and a holel even if they don’t have a job yet. Inserting a hotel requires contract and employee info. Deleting an employee or hotel will result in deleting employee and contract info as well.

(b) Describe and illustrate the process of normalizing the table shown above to 3NF. State any assumptions you make about the data shown in this table.

Separate into an employee table, hotel table, and contract table.

Employee Table: PK\_NIN, eName

Hotel Table: PK\_hNo, hLoc

Contract Table: PK\_contractNo, FK\_NIN, FK\_hNo, hours

1. A company called FastCabs provides a taxi service to clients. The table shown below displays some details of client bookings for taxis. Assume that a taxi driver is assigned to a single taxi, but a taxi can be assigned to one or more drivers.

A screenshot of a computer

Description generated with very high confidence

(a) Identify the functional dependencies that exist between the columns of the table above and identify the primary key and any alternate key(s) (if present) for the table.

JobDate Time and jobPickUpAddress are dependent on JobID

driverName is dependent on driverID and taxiID

clientName is dependent on clientID

(b) Describe why the table above is not in 3NF.

The table is not 3NF because it forces dependencies between fields that should be in separate tables. There are also numerous instances of repeating data.

(c) The table shown above is susceptible to update anomalies. Provide examples of how insertion, deletion and modification anomalies could occur on this table.

Inserting clients or drivers requires a job. Deleting a job could result in deleting client info and driver info. Deleting a driver could result in deleting a client or job information.

1. Applying normalisation to 3NF on the table shown in the previous exercise results in the formation of the three 3NF tables shown below.

A screenshot of a cell phone

Description generated with very high confidence

(a) Identify the functional dependencies that exist between the columns of each table and identify the primary key and any alternate and foreign key(s) (if present) for each table.

Job Table:

Functional dependencies:

JobDateTime and jobPickUpAddress depend on JobID

PK🡪 JobID, FK 🡪 driverID, FK🡪 ClientID

Driver Table:

Functional dependencies:

driverName and taxiID depend on driverID

PK🡪 driverID

Client Table:

Functional dependencies:

clientName depends on ClientID

PK🡪 clientID

(b) Describe why storing the FastCabs data across three 3NF tables avoids the update anomalies described in the previous exercise.

You can insert/delete/update drivers and client information separately. You can only insert Job information with valid driverIds and clientIds.

(c) Describe how the original table shown the previous exercise can be re-created through relational joins between primary key and foreign keys columns of the tables above.

JobTable JOIN DriverTable ON driverID

JOIN ClientTalbe ON clientID

1. Student can lease university flats and some of the details of leases held by students for places in university flats are shown below. A place number (placeNo) uniquely identifies each single room in all flats and is used when leasing a room to a student.

A screenshot of a cell phone

Description generated with very high confidence

(a) Identify the functional dependencies that exist between the columns of the table and identify the primary key and any alternate key(s) (if present) for the table.

fName, lName, startDate, finishDate are all dependent on leaseNo

fName and lName are dependent on bannerID

flatAddress is dependent on flatNo

PK🡪leaseNo

(b) Describe why the table is not in 3NF.

The table is not 3NF because it forces dependencies between fields that should be in separate tables and there are also numerous instances of repeating data.

(c) The table shown in Figure is susceptible to update anomalies. Provide examples of how insertion, deletion, and modification anomalies could occur on this table.

Deleting a flat could result in deleting student data or lease data. Inserting flat info would require student and lease info.

1. Applying normalisation to 3NF on the table shown in the previous exercise results in the formation of the four tables shown below.

A screenshot of a cell phone

Description generated with very high confidence

(a) Identify the functional dependencies that exist between the columns of each table and identifythe primary key and any alternate and foreign key(s) (if present) for each table.

Lease Table: PK🡪 leaseNo, FK 🡪 bannerID, FK🡪 placeNo

Flat Table: PK 🡪 flatNo

Banner Table: PK 🡪 bannerID

Place Table: PK 🡪 placeNo, FK 🡪 flatNo

(b) Describe why storing the university accommodation data across four 3NF tables avoids the update anomalies described in the previous exercise.

It avoids the anomalies because each table only has non-key fields that are dependent on their primary keys.

(d) Describe how the original table shown in the previous exercise can be re-created through relational joins between primary key and foreign keys columns of the tables above.

LeaseTable JOIN FlatTable ON floatNo

JOIN BannerTable ON bannerID

JOIN PlaceTable ON placeNo