14.14

(a) Identify functional dependencies and assumptions

Assumptions

* A patient can be in one ward and one bed at a time.
* Each drug has a unique Drug Number.
* Drug Number determines Name, Description, and Dosage.
* A patient can be treated with multiple drugs, and the same drug can be used more than once at different times.

Attributes

* Patient Number, Full Name, Bed Number, Ward Number, Ward Name
* Drug Number, Drug Name, Description, Dosage
* Method of Admin, Units per Day, Start Date, Finish Date

Dependencies

* PatientNumber → FullName, BedNumber, WardNumber
* WardNumber → WardName
* DrugNumber → DrugName, Description, Dosage

(b) The process of normalizing the attributes

1NF

* PatientNumber
* FullName
* BedNumber
* WardNumber
* WardName
* DrugNumber
* DrugName
* Description
* Dosage
* MethodOfAdmin
* UnitsPerDay
* StartDate
* FinishDate

2NF

* Patient (PatientNumber, FullName, BedNumber, WardNumber, WardName)
* Drug (DrugNumber, DrugName, Description, Dosage)
* Medication (PatientNumber, DrugNumber, StartDate, MethodOfAdmin, UnitsPerDay, FinishDate)

3NF

* Patient (PatientNumber, FullName, BedNumber, WardNumber)
* Ward (WardNumber, WardName)
* Drug (DrugNumber, DrugName, Description, Dosage)
* Medication (PatientNumber, DrugNumber, StartDate, MethodOfAdmin, UnitsPerDay, FinishDate)

(c) Identify Keys  
  
Primary Keys:

* Patient: PatientNumber
* Ward: WardNumber
* Drug: DrugNumber
* Medication: {PatientNumber, DrugNumber, StartDate}

#### Alternate Keys:

* BedNumber
* WardName
* DrugName

#### Foreign Keys:

* Patient.WardNumber → Ward.WardNumber
* Medication.PatientNumber → Patient.PatientNumber
* Medication.DrugNumber → Drug.DrugNumber

14.15

(a) Examples of insertion, deletion, and update

* If there is a new dentist, I cannot insert it to the table until the dentist has an appointment. This table is not allowing to create dentist information independently.
* If I delete the schedule of patient Jill Bell, dentist Tony Smith will also be deleted and I can lost the dentist information when there are no other records for his exists
* If I update the dentist name or patient number, I will need to update in multiple rows. If I forgot to update all rows, the table will have inconsistent data.

(b) Identify functional dependencies and assumptions

* staffNo → dentistName, surgeryNo
* patNo → patName
* staffNo, appointmentDate, time → patNo, patName, surgeryNo

(c) 3NF

Dentist(staffNo, dentistName)

Primary Key: staffNo

Patient(patNo, patName)

Primary Key: patNo

Appointment(staffNo, patNo, appointmentDate, time, surgeryNo)

Primary Key: (staffNo, appointmentDate, time)

Foreign Keys: staffNo → Dentist, patNo → Patient