14.14a

Identified Attributes:

1. Patient Number
2. Full name
3. Ward Number
4. Bed Number
5. Ward Name
6. Drug Number
7. Drug Name
8. Drug Description
9. Dosage
10. Method of Admin
11. Units per day
12. Start date
13. Finish date

Assumptions:

1. A patient can be assigned to a ward and a ward can have zero or more patients
2. Each patient number identifies one patient.
3. Each ward number identifies one ward
4. Each drug number identifies a drug and determines it's name and description
5. A patient can be administered multiple drugs
6. A drug can be administered to multiple patient

Functional Dependencies

Patient number -> Full name,

Ward Number -> Ward name, Bed number

Drug Number->Drug Name, Drug Name, Drug Description

Drug Number, Patient Number, Start Date -> Dosage, method of Admin, units per day, finish date

14.14b

The Figure is already in 1Nf as the data is atomic and no array of data for a column.

2NF

Partial dependencies:

Patient number -> Full name, ward number, ward name, bed number

Drug number -> drug name, drug description

Tables:

Patient: PatientNumber, FullName, WardNumber, BedNumber

Ward: WardNumber, WardName

Drug: DrugNumber, DrugName

Medication: PatientNumber, DrugNumber, Dosage, StartDate, MethodOfAdmin, UnitsPerDay, FinishDate

3NF

PatientNumber ->WardNumber

WardNumber -> WardName

By trasitive dependencies, PatientNumber -> WardName. This is not correct, as WardName is not transitively dependent on PatientNumber as a patient can possibly be assigned to another ward on a next visit. We split this table

Patient: PatientNumber, FullName

Ward: WardNumber, WardName, BedNumber

Also a BedNumber cannot always be determined by WardNumber, we have to introduce an Adminsion table as a linking table for Patient and Ward:

Admission: PatientNumber, WardNumber, BedNumber, AdmissionDate.

New Tables:

Patient: PatientNumber, FullName

Ward: WardNumber, WardName

Admission: PatientNumber, WardNumber, BedNumber, AdmissionDate.

Drug: DrugNumber, DrugName

Medication: PatientNumber, DrugNumber, Dosage, StartDate, MethodOfAdmin, UnitsPerDay, FinishDate

14.14c

Primary Keys:
Patient: PatientNumber
Ward: WardNumber
Drug: DrugNumber
Medication: PatientNumber, DrugNumber, StartDate

Alternate Key:

Ward: Ward name could be an alternate key as it is expected to always be unique per ward. However one needs to have a guarantee on this to be definite.

Foreign Key:

Admission: PatientNumber, WardNumber
Medication: PatientNumber, DrugNumber

14.15a

Insertion Anomaly: For every insertion, you must get patient details and staff details, this results in data redundancy. Also, you must create a fake appointment and fake patient when you want to add a new staff and fake appointment and fake staff when you want to simply add a patient.

Deletion Anomaly: Deleting a staff who perhaps resigned will lead to the deletion of a valid appointments assigned to that staff. Also deleting an appointment for a patient with just one record on the system will complete removes all knowledge of that patient, likewise the staff if was only assigned an appointment.

Update Anomaly: Updating Patient of staff details will require making an update on all records involved which might be costly on a large database. There is also a risk on inconsistency here.

14.15b

Assumption:

Each staffNo identifies a dentist

Each PatNo identifies a patient

A surgery is fixed for every appointment

A dentisit can be assigned to many patient and a patient can be treated by many dentist

Functional dependencies:

StaffNo -> dentistName

PatNo -> patName

StaffNo, PatNo, AppiontmentDate -> surgeryNo

14.15c

Normalised table:

Staff : StaffNo, destistName

Patient: PatNo, PatName

Surgery: SurgeryNo

Appointment: StaffNo, PatNo, SurgeryNo, AppoitmentDateTime

Primary Keys:

Staff: StaffNo

Patient: PatNo

Surgery: SurgeryNo

Appointment: StaffNo, AppoitmentDatetime