Part I. Short answer. Write your answers in the space provided.

1) (3 pts.) What is "metadata" and how does it relate to the definition of a database?

2) (5 pts.) What are "referential integrity constraints"? Give an example.

3) (6 pts.)What six requirements or conditions must a two-dimensional table satisfy in order to be a relation in the relational model?

4) (3 pts.) Explain the terms **relation**, **tuple**, and **attribute**.

5) (3 pts.) Distinguish between the primary key and a candidate key.

6) (3 pts.) Explain the concept of a foreign key.

7) (3 pts.) Explain the concept of a surrogate key.

8) (3 pts.) Explain three possible interpretations of a null value.

9) (3 pts.) Explain the concept of a functional dependency.

11) (4 pts.) Explain two methods for defining a primary key using SQL.

Part II. Relations and Normal Forms

12) (3 pts.) Define Boyce Codd Normal Form

13) (12 pts) This problem will be to convert the following relation to BCNF, explaining the process along the way.

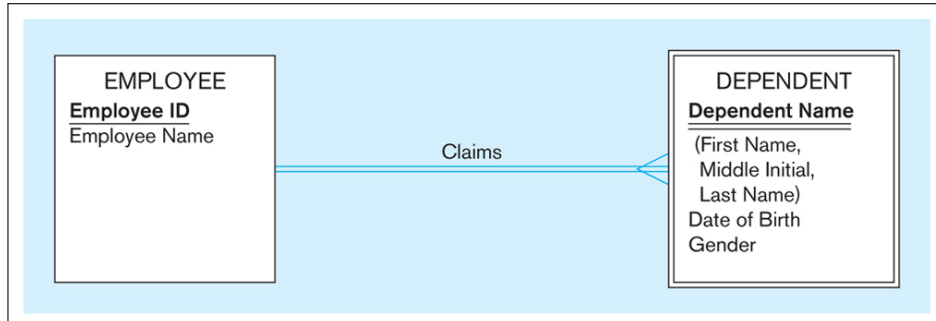| Name	Phone	Email	InvoiceNumber	Date	PreTaxAmount
Elizabeth Stanley	555-236-7789	ES@somewhere.com	1000	5/5/2006	$ 155.00
Fred Price	555-236-0091	FP@somewhere.com	1010	5/7/2006	$ 203.00
Linda Becky	555-236-0392	LB@somewhere.com	1020	5/11/2006	$ 75.00
Pamela Birch	555-236-4493	PB@somewhere.com	1030	5/15/2006	$ 67.00
Richardo Romez	555-236-3334	RR@somewhere.com	1040	5/15/2006	$ 330.00
Elizabeth Stanley	555-236-7789	ES@somewhere.com	1050	5/16/2006	$ 25.00
Linda Becky	555-236-0392	LB@somewhere.com	1060	5/16/2006	$ 45.00
Elizabeth Stanley	555-236-7789	ES@somewhere.com	1070	5/18/2006	$ 445.00
Smantha Jackson	555-236-1095	SJ@somewhere.com	1080	5/19/2006	$ 72.00

a. Using these data, state assumptions about functional dependencies among the columns of data. Justify your assumptions on the basis of these sample data and also on the basis of what you know about retail sales.

b. In the design process, it might be a good idea to add a new field. However, suppose you are restricted to using the fields above. Produce a two-relation schema that is in BCNF.
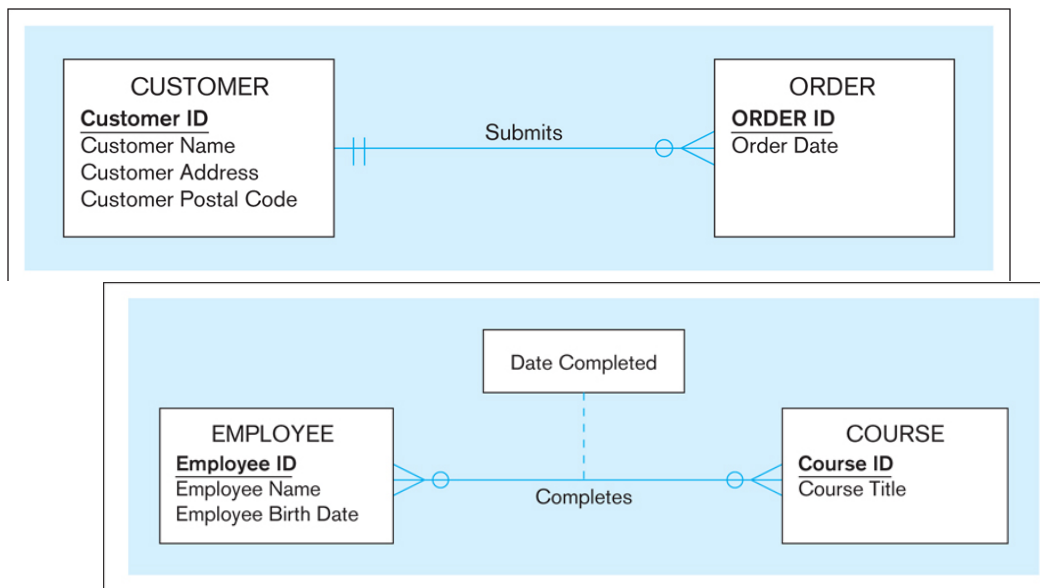
14) (6 pts.) Using the relation above or another of your choice, describe the three types of data anomalies

1. (20 pts.) For each of the ER diagrams given, give the associated relational/logical schema
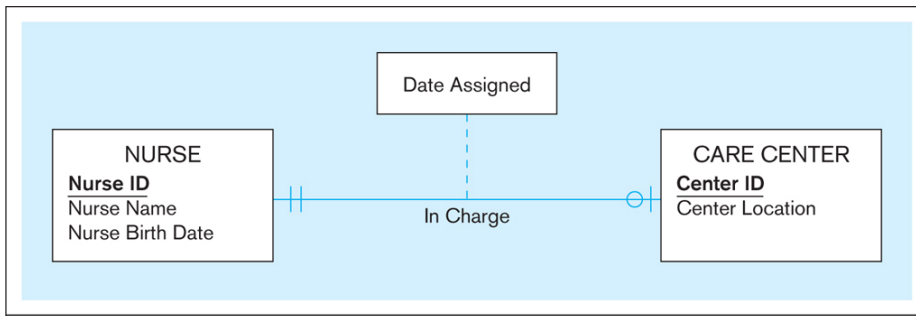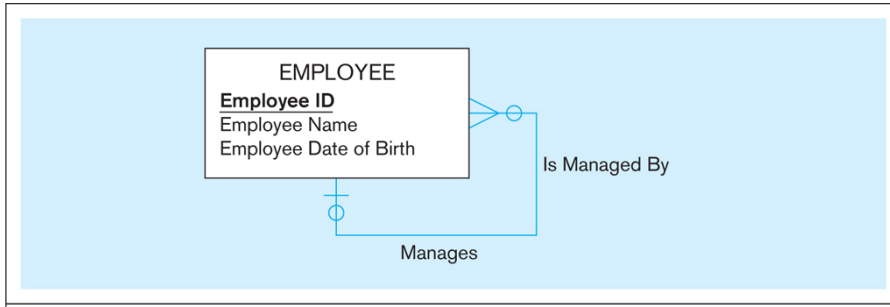
a.

b.

d.

NURSE
Nurse ID
Nurse Name
Nurse Birth Date

Date Assigned

In Charge

CARE CENTER
Center ID
Center Location

e.

EMPLOYEE
Employee ID
Employee Name
Employee Date of Birth

Is Managed By

Manages

2. (5 pts.) What is de-normalization in designing relations? Give the **primary** benefit and the **primary** disadvantage of de-normalization. When should this technique be used?