Readings:

• chapter 4: “Logical Database Design and the Relational Model” (Hoffer, Ramesh, & Topi)

• chapter 3: “SQL Server Management Studio” (Petkovic)

Homework:

Chapter 4 (Hoffer, Ramesh, & Topi)

Problems and Exercises 2,6,9

2. **For each of the following EER diagrams from Chapter 3:**

* 1. **Transform the diagram into a relational schema that shows referential integrity constraints (see Figure 4-5 for**

**an example of such a schema).**

* 1. **For each relation, diagram the functional dependencies**

**(see Figure 4-23 for an example).**

* 1. **If any of the relations are not in 3NF, transform them**

**to 3NF.  
a. Figure 3-6b b. Figure 3-7a c. Figure 3-9 d. Figure 3-10 e. Figure 3-11**

1. Transformed figure 3-6b into relational schema which shows referential integrity constraints with functional dependencies and 3NF form. In 3-6b there is supertype/subtype relation which is depicted in the relational schema diagram.

Answers:

Entity Name : Vehicle  
Attribute Name: vehicle\_id, price, engine\_displacement, make, model.  
primary key – vehicle\_id  
functional Dependency :   
 vehicle\_ID-> price, engine\_displacement, make, model.  
Vehicle\_ID – primary key  
C\_Vehicle\_ID -> No\_Of\_Passengers  
C\_Vehicle\_ID – primary key  
T\_Vehicle\_ID -> capacity, cab\_Type   
T\_Vehicle\_ID – primary key  
Below Relational Schema is in 3NF form.

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b) PATIENT Diagram

Transformed figure 3.7a) into relational schema which shows referential integrity constraints with functional dependencies and 3NF form. In 3-6b there is supertype/subtype relation which is depicted in the relational schema diagram.

ENTITY – Responsible\_Physician, Patient, Out\_Patient, Resident\_Patient, Bed.

Functional Dependencies:

1)Patient  
- Patient\_ID -> Patient\_Name, Admit\_Date, Physician\_ID  
Patient\_ID – primary key

2) Out\_Patient  
O\_Patient\_ID -> Checkback\_Date  
O\_Patient\_ID – primary key  
3)Resident\_Patient  
R\_Patient\_ID-> Date\_Discharged, Bed\_ID

R\_Patient\_ID – primary key

Relation is in 3NF form.

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c)

Transformed figure 3.9) into relational schema which shows referential integrity constraints with functional dependencies and 3NF form. In 3-6b there is supertype/subtype relation which is depicted in the relational schema diagram.

Entity – Part, Manufactured\_Part, Purchased\_Part, Supply\_Line, Supplier  
Functional Dependencies:  
1) Part  
Part\_No-> Description, Location, Qty\_On\_Hand, Manufactured?, Purchased?  
Part\_No – Primary key  
2) Manufactured\_Part  
M\_Part\_No->Routing\_Number  
M\_Part\_No – Primary key

3) Supply\_Line  
P\_Part\_No->Supplier\_ID, Unit\_Price

P\_Part\_No – Primary key  
There is no transitive dependency hence it is 3NF form relational schema.

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d)

Entity – Person, Employee, Alumnus, Student, Degree, Staff, Faculty, Graduate, Under Graduate.

Primary key for Person – SSN  
- Functional Dependency : SSN-> Name, Address, Gender, Date\_Of\_Birth  
Primary Key for Employee- E\_SSN  
- Functional Dependency: E\_SSN->Salary, DateHired.  
Primary key for Alumnus – A\_SSN  
Primary key for Degree : A\_SSN

-Functional Dependency: A\_SSN-> Degree, Year  
Date and Designation does not have transitive dependency.  
Primary key for Student : S\_SSN  
Functional Dependency: S\_SSN->Major\_Department.  
Primary Key for Graduate: G\_SSN  
Functional Dependency: G\_SSN-> Test\_Score

Primry key for Under Graduate: UG\_SSN  
Functional Dependency: UG\_SSN-> Class\_Standing

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The above relational Schema is in 3NF form.

e) 3.11 figure transformation

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Functional Dependency

1. Customer\_ID->Customer\_Name, Customer\_Address, Customer\_PostalAddress
2. Territory\_ID->Territory\_Name
3. Order\_ID->Order\_Date,Customer\_ID
4. Order\_ID->Product\_ID, Order\_Quantity
5. Territory\_ID->R\_Customer\_ID
6. N\_Customer\_ID->Account\_Manager
7. Sales\_Person\_ID->Sales\_Person\_Name, Sales\_Person\_Telephone,Sales\_Person\_Fax, Territory\_ID
8. Product\_ID->Product\_Description,Product\_Finish,Product\_Standard\_Price, Product\_Line\_ID
9. Product\_Line\_ID->Product\_Line\_Name
10. Product\_ID->Goes\_Into\_Quantity,Material\_ID
11. Material\_ID->Material\_Name,Material\_Standard\_Cost,Unit\_Of\_Measure
12. Vendor\_ID->Vendor\_Address,Vendor\_Name
13. S\_Vendor\_ID->Supply\_Unit\_Price,Material\_ID
14. S\_Vendor\_ID->Contract\_Number
15. Work\_Center\_ID->Work\_Center\_Location
16. Product\_ID->Work\_Center\_ID
17. Employee\_ID-> Employee\_Name,Employee\_Address, Employee\_Type
18. U\_Employee\_ID->Work\_Center\_ID
19. U\_Employee\_ID->Supervisor\_ID
20. Employee\_ID->Skill\_ID
21. Skill\_ID->Skill

The relational Schema is in 3NF form.

6)

Figure4-33

1. b) c) – Relational Schema, Functional Dependencies, 3NF form.

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1. Customer\_ID-> Cust\_Name,Cust\_Address
2. Account\_ID->Exp\_Date,Card\_Type,Customer\_ID
3. C\_Account\_ID->Cur\_Bal
4. D\_Account\_ID->Bank\_No
5. Merch\_ID->C\_Account\_ID,Charge\_Time,Charge\_Date,Amount
6. Merch\_ID->Merch\_Addr

9)

1. total quantity can be calculated from weight of product and quantity , below is relational diagram with functional dependency.

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1. this relation is in 1-NF (first normal form) because all multi-valued attributes have been removed.

* From above figure we can see that it does not follow rules of 2NF and 3NF hence it does not satisfy the two forms and not shown in relational schema.

1. Relational schema in 3NF form drawn below
2. Also, 3NF with referential integrity

– Both in same diagram with functional Dependency

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Functional Dependency

1. Shipment\_ID-> Shipment\_Date, Expected\_Arrival\_Date, Origin,Destination, Shipment\_Number,Captain\_ID
2. Shipment\_ID-> Item\_Number,Quantity
3. Item\_Number->Type,Description,Weight
4. Captain\_ID->Captain\_Name
5. ERD diagram

