***15.28***

***R = {Course\_no, Sec\_no, Offering\_dept, Credit\_hours, Course\_level, Instructor\_ssn, Semester, Year, Days\_hours, Room\_no, No\_of\_students}***

***{Course\_no} → {Offering\_dept, Credit\_hours, Course\_level}***

***{Course\_no, Sec\_no, Semester, Year} → {Days\_hours, Room\_no, No\_of\_students, Instructor\_ssn}***

***{Room\_no, Days\_hours, Semester, Year} → {Instructor\_ssn, Course\_no, Sec\_no}***

Khóa dự tuyển của R là {Course\_no, Sec\_no, Semester, Year} và   
Vì bao đóng{Course\_no, Sec\_no, Semester, Year}+ = {Course\_no, Sec\_no, Offering\_dept, Credit\_hours, Course\_level, Instructor\_ssn, Semester, Year, Days\_hours, Room\_no, No\_of\_students}

R vi phạm 2NF  
{Course\_no} → {Offering\_dept, Credit\_hours, Course\_level}

{Sec\_no, Semester, Year} → {Days\_hours, Room\_no, No\_of\_students, Instructor\_ssn}

R không vi phạm 3NF

***15.29***

***ORDER (******O#,*** ***Odate, Cust#, Total\_amount)***

***ORDER\_ITEM (O******#, I#,*** ***Qty\_ordered, Total\_price, Discount%)***

NATURAL JOIN: RESULT (O#, Odate, Cust#, Total\_amount, I#, Qty\_ordered, Total\_price, Discount%)

Functional dependencies are:  
{O#} → {Odate, Cust#, Total\_amount}

{O#, I#} → {Qty\_ordered, Total\_price, Discount%}

Minimal key of RESULT if {O#, I#}  
Because {O#, I#}+ = {O#, I#, Odate, Cust#, Total\_amount, Qty\_ordered, Total\_price, Discount%}

RESULT is not in 2NF vì {O#} → {Odate, Cust#, Total\_amount}

RESULT is not in 3NF because it is not in 2NF.

***15.31***

***BOOK (Book\_title, Author\_name, Book\_type, List\_price, Author\_affil, Publisher)***

***Book\_title → Publisher, Book\_type***

***Book\_type → List\_price***

***Author\_name → Author\_affil***

1. Candidate key is {Book\_title}

BOOK is in 2NF because all attributes have atomic values (1NF) and the key is Book\_title (1 attribute)

BOOK is in 3NF because there are no transitive dependencies where a non-prime attribute depends on another non-prime attribute through {Book\_title}.

1. Decomposition:  
   BOOK1(Book\_title, Publisher, Book\_type)  
   BOOK2 (Author\_name, Author\_affil)  
   BOOK3(Book\_type, List\_price)

15.30

CAR\_SALE(Car#, Date\_sold, Salesperson#, Commission%, Discount\_amt)

Date\_sold → Discount\_amt and

Salesperson# → Commission%

The relation is in 1NF because all attributes have atomic values

The relation is not in 2NF because Salesperson# → Commission%

* Normalize: CAR\_SALE1 (Car#, Date\_sold, Discount\_amt)  
   CAR\_SALE2 (Salesperson#, Commission%)

After normalizing, the relations are in 3NF now.

15.32

DISK\_DRIVE (Serial\_number, Manufacturer, Model, Batch, Capacity, Retailer)

1. {Manufacturer, Serial\_number} → {Model, Batch, Capacity, Retailer}
2. {Model} → {Manufacturer}
3. {Model} → {Batch}
4. {Model, Manufacturer} → {Capacity}

15.33

R (Doctor#, Patient#, Date, Diagnosis, Treat\_code, Charge)

The Functional dependencies are:

{Doctor#, Patient#, Date} → {Diagnosis, Treat\_code, Charge}  
 {Diagnosis}→{Doctor#, Patient#}  
{Treat\_code} → {Charge}

The relation is in 2NF but not in 3NF

15.34

CAR\_SALE (Car\_id, Option\_type, Option\_listprice, Sale\_date, Option\_discountedprice)

CarID → Sale\_date

Option\_type → Option\_listprice

CarID, Option\_type → Option\_discountedprice

The relation is not in 2NF because {CarID, Option\_type} is key but CarID → Sale\_date and Option\_type → Option\_listprice

The relation is not in 3NF because it is not in 2NF