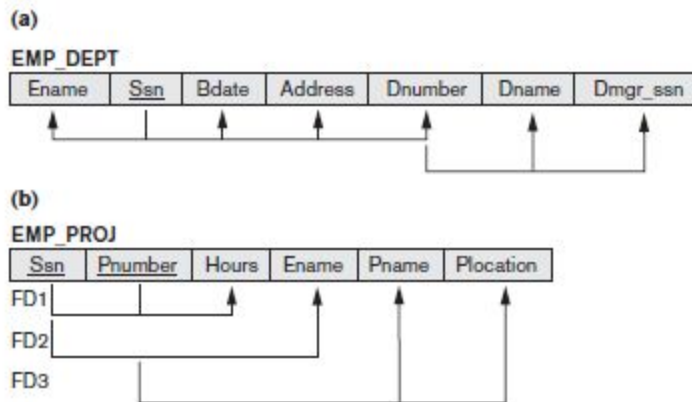


15.20 What update anomalies occur in the EMP_PROJ and EMP_DEPT relations of Figure 15.3 and 15.4?

Figure 15.3

Two relation schemas suffering from update anomalies. (a) EMP_DEPT and (b) EMP_PROJ.



EMP_DEPT							Redundancy	
Ename	Ssn	Bdate	Address	Dnumber	Dname	Dmgr_ssn		
Smith, John B.	123456789	1965-01-09	731 Fondren, Houston, TX	5	Research	333445555		
Wong, Franklin T.	333445555	1955-12-08	638 Voss, Houston, TX	5	Research	333445555		
Zelaya, Alicia J.	999887777	1968-07-19	3321 Castle, Spring, TX	4	Administration	987654321		
Wallace, Jennifer S.	987654321	1941-06-20	291 Berry, Bellaire, TX	4	Administration	987654321		
Narayan, Ramesh K.	666884444	1962-09-15	975 FireOak, Humble, TX	5	Research	333445555		
English, Joyce A.	453453453	1972-07-31	5631 Rice, Houston, TX	5	Research	333445555		
Jabbar, Ahmad V.	987987987	1969-03-29	980 Dallas, Houston, TX	4	Administration	987654321		
Borg, James E.	888665555	1937-11-10	450 Stone, Houston, TX	1	Headquarters	888665555		

EMP_PROJ						Redundancy	
Ssn	Pnumber	Hours	Ename	Pname	Plocation		
123456789	1	32.5	Smith, John B.	ProductX	Bellaire		
123456789	2	7.5	Smith, John B.	ProductY	Sugarland		
666884444	3	40.0	Narayan, Ramesh K.	ProductZ	Houston		
453453453	1	20.0	English, Joyce A.	ProductX	Bellaire		
453453453	2	20.0	English, Joyce A.	ProductY	Sugarland		
333445555	2	10.0	Wong, Franklin T.	ProductY	Sugarland		
333445555	3	10.0	Wong, Franklin T.	ProductZ	Houston		
333445555	10	10.0	Wong, Franklin T.	Computerization	Stafford		
333445555	20	10.0	Wong, Franklin T.	Reorganization	Houston		
999887777	30	30.0	Zelaya, Alicia J.	Newbenefits	Stafford		
999887777	10	10.0	Zelaya, Alicia J.	Computerization	Stafford		
987987987	10	35.0	Jabbar, Ahmad V.	Computerization	Stafford		
987987987	30	5.0	Jabbar, Ahmad V.	Newbenefits	Stafford		
987654321	30	20.0	Wallace, Jennifer S.	Newbenefits	Stafford		
987654321	20	15.0	Wallace, Jennifer S.	Reorganization	Houston		
888665555	20	Null	Borg, James E.	Reorganization	Houston		

Figure 15.4

Sample states for EMP_DEPT and EMP_PROJ resulting from applying NATURAL JOIN to the relations in Figure 15.2. These may be stored as base relations for performance reasons.

15.29 Consider the following relations for an order-processing application database at ABC, Inc.

ORDER (O#, Odate, Cust#, Total_amount)

ORDER-ITEM (O#, I#, Qty_ordered, Total_price, Discount%)

Assume that each item has a different discount. The Total_price refers to one item, Odate is the date on which the order was placed, and the Total_amount is the amount of the order. If we apply a natural join on the relations Order-Item and Order in this database, what does the resulting relation schema look like? What will be its key? Show the FDs in this resulting relation. Is it in 2NF? Is it in 3NF? Why or why not? (State any assumptions you make.)

15.30 Consider the following relation:

CAR_SALE(Car#, Date_sold, Salesman#, Commission%, Discount_amt)

Assume that a car may be sold by multiple salesmen and hence {CAR#, SALESMAN#} is the primary key.

Additional dependencies are:

Date_sold → Discount_amt and

Salesman# → commission%

Based on the given primary key, is this relation in 1NF, 2NF, or 3NF? Why or why not? How would you successively normalize it completely?

15.31 Consider the following relation for published books:

BOOK (Book_title, Authorname, Book_type, Listprice, Author_affil, Publisher)

Author_affil refers to the affiliation of the author. Suppose the following dependencies exist:

Book_title → Publisher, Book_type

Book_type → List_price

Author_name → Author_affil

a. What normal form is the relation in? Explain your answer.

b. Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition.

15.32 This exercise asks you to convert business statements into dependencies. Consider the following relation DISK_DRIVE (*serialNumber, manufacturer, model, batch, capacity, retailer*). Each tuple in the relation DISK_DRIVE contains information about a disk drive with a unique serialNumber, made by a manufacturer, with a particular model, released in a certain batch, which has a certain storage capacity, and is sold by a certain retailer. For example, the tuple DISK_DRIVE (1978619, WesternDigital, A2235X, 765234, 500, CompUSA) specifies that WesternDigital made a disk drive with serial number 1978619, model number A2235X in batch 765235 with 500GB that is sold by CompUSA.

Write each of the following dependencies as an FD:

Suggestion:

a. the manufacturer and serial number uniquely identifies the drive

b. A model number is registered by a manufacturer and hence can't be used by another manufacturer.

c. All disk drives in a particular batch are the same model.

d. All disk drives of a particular model of a particular manufacturer have exactly the same capacity.

15.33 Consider the following relation:

$R(\underline{\text{Doctor\#}}, \underline{\text{Patient\#}}, \underline{\text{Date}}, \text{Diagnosis}, \text{Treat_code}, \text{Charge})$

In this relation, a tuple describes a visit of a patient to a doctor along with a treatment code and daily charge. Assume that diagnosis is determined (uniquely) for each patient by a doctor. Assume that each treatment code has a fixed charge (regardless of patient). Is this relation in 2NF? Justify your answer and decompose if necessary. Then argue whether further normalization to 3NF is necessary, and if so, perform it.