

Tutorial 3

Exercise 1. Examine the table shown below. The table has information about the branches of a company and staff at the branches. Assume each branch has only one telephone number.

branchNo	branchAddress	telNo	staffNo	sName
B001	8 Jefferson Way, Portland, OR 97201	503-555-3618	S1500	Tom Daniels
B002	City Center Plaza, Seattle, WA 98122	206-555-6756	S0010	Mary Martinez
B003	14 - 8th Avenue, New York, NY 10012	212-371-3000	S0145	Art Peters
B003	14 - 8th Avenue, New York, NY 10012	212-371-3000	S0306	Jane Smith
B004	16 - 14th Avenue, Seattle, WA 98128	206-555-3131	S2250	Sally Stern

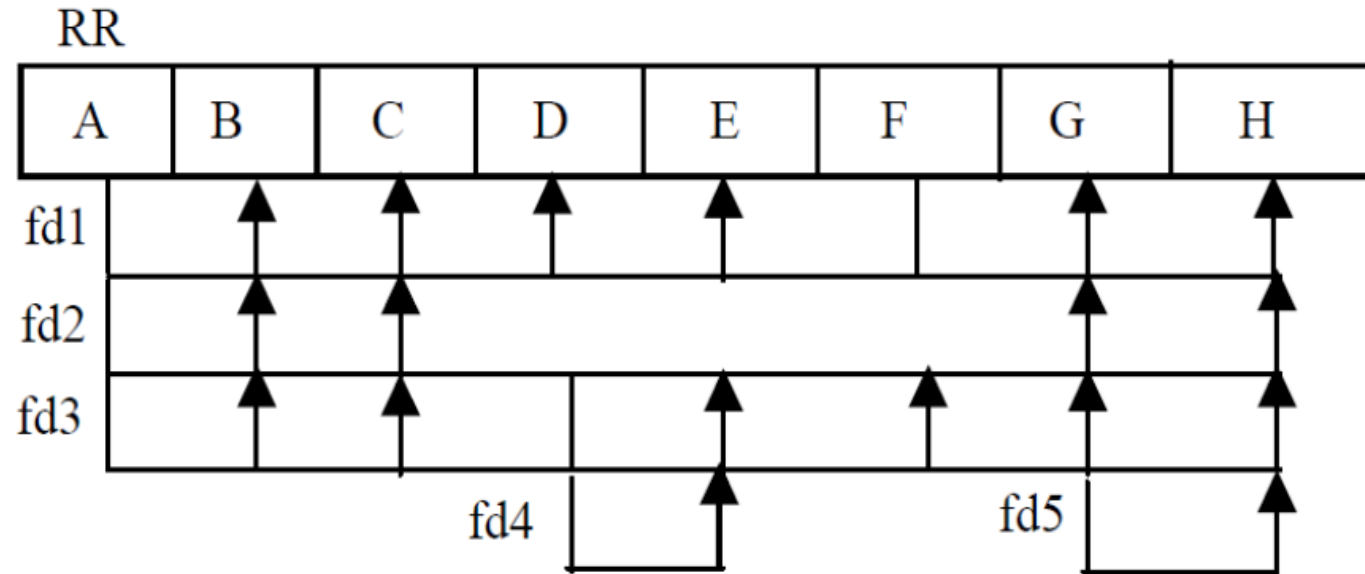
- Which normal form is this table in? Why?
- Describe and illustrate the process of normalizing the data shown in this table to third normal form (3NF).
- Identify the primary and foreign keys in your 3NF relations.

a) Which normal form is this table in? Why?

- b) Describe and illustrate the process of normalizing the data shown in this table to third normal form (3NF).

c) Identify the primary and foreign keys in your 3NF relations

Exercise 2. Given the following relation and its functional dependencies:



- Specify candidate keys and state the primary key.
- Assuming that the relation is in first normal form (1NF), describe and illustrate the process of normalizing the relation schema to second (2NF) and third (3NF) normal forms.

a) Specify candidate keys and state the primary key.

b) Assuming that the relation is in first normal form (1NF), describe and illustrate the process of normalizing the relation schema to second (2NF) and third (3NF) normal forms.

Exercise 3. Answer the following questions for the schedule of two transactions T1 and T2.

Time	T1	T2
t_1		begin_transaction
t_2	begin_transaction	read(X)
t_3	read(X)	$X = X + 200$
t_4	$X = X - 50$	write(X)
t_5	write(X)	commit
t_6	commit	

- a) What is the problem of updating X in the two transactions T1 and T2? Explain your answer.
- b) Rewrite T1 and T2 in **Figure 1** using Two-Phase Locking (2PL).

Exercise 3: a) What is the problem of updating X in the two transactions T1 and T2? Explain your answer.

Exercise 3: b) Rewrite T1 and T2 using Two-Phase Locking (2PL).

Solution: (Red part indicates the added actions for 2PL)

Time	T1	T2
t ₁		begin_transaction
t ₂	begin_transaction	read(X)
t ₃	read(X)	X = X+200
t ₄	X = X-50	write(X)
t ₅	write(X)	commit
t ₆	commit	

Time	T1	T2
t ₁		begin_transaction
t ₂		
t ₃		
t ₄		
t ₅		
t ₆		
t ₇		
t ₈		
t ₉		
t ₁₀		

Exercise 4

Which of the following statements are correct:

- A. If all locks are acquired at the beginning of the transaction, then cascading rollback will not happen.
- B. If all locks are acquired at the beginning of the transaction, then deadlock will not happen.
- C. Deadlock can be resolved by timeouts, i.e. transaction that requests lock will only wait for a system-defined period of time.
- D. When using timeouts, it is possible that the DBMS aborts a transaction that is not in a deadlock.

Exercise 5. The following figure illustrate a number of transactions being processed from t_0 until t_f when system had a power failure. At t_c a checkpoint was done. Explain for each transactions in the figure below how recovery is done.

