

San Jose State University  
CMPE 138: Database Systems

Spring 2025

Homework 3

Due: 11/27/2024 @11:59pm

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**Please submit your solution to Canvas for this assignment, as a PDF document. Follow the homework policy document for instructions on how to submit this homework. References to figures, sections, tables and queries are from your textbook.**

**Problem 1 (20 points)**

What update anomalies occur in the EMP\_PROJ and EMP\_DEPT relations of Figure 14.3 and 14.4?

**Problem 2 (25 points)**

Consider the following relations for an order-processing application database at XYZ, 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 BCNF? Why or why not? (State any assumptions you make.)

**Problem 3 (25 points)**

List all possible schedules for transactions T 1 and T 2, and determine which are conflict serializable (correct) and which are not.

T 1	T 2
read_item(X);	read_item(X);
X := X - N	X := X + M;
write_item(X);	write_item(X);
read_item(Y);	

$Y := Y + N;$   
`write_item(Y);`

The transactions can be written as follows using shorthand notation:

$T_1 : r_1(X); w_1(X); r_1(Y); w_1(Y);$

$T_2 : r_2(X); w_2(X);$

An example of a possible schedule is:  $r_1(X); r_2(X); w_1(X); r_1(Y); w_1(Y); w_2(X);$

This schedule is not serializable because  $w_1(X)$  happens after  $r_2(X)$ .

#### Problem 4

(20 points)

Which of the following schedules is (conflict) serializable? For each serializable schedule, determine the equivalent serial schedules.

(a)  $r_1(X); r_3(X); w_1(X); r_2(X); w_3(X)$

(b)  $r_1(X); r_3(X); w_3(X); w_1(X); r_2(X)$

(c)  $r_3(X); r_2(X); w_3(X); r_1(X); w_1(X)$

(d)  $r_3(X); r_2(X); r_1(X); w_3(X); w_1(X)$

***10 points will be awarded for following the homework guidelines document.***