The City College of New York
Department of Computer Science
Spring 2021 Semester

CSc 33600 Introduction to Database Systems

Assignment 3

A printed report showing [1] *the problem,* [2] *solution methods,* [3] *codes developed, and* [4] *outputs produced for the queries indicated is due at or before* 11:00 *pm on Thursday,* 17 November 2021. ***The deadline is strictly observed***.

The Products Database

1. Consider the **Products** database schema and sample data in the course textbook[1] [pages 52-54], modified as followa:

   Products(*maker*, *model*, *type*)
   PCs(*maker*, *model*, *speed, ram, hd, price*)
   Laptops(*maker*, *model*, *speed, ram, hd, screen, price*)
   Printers(*maker*, *model*, *color, type, price*)

   where *type* ∈ {'PC', 'Laptop', 'Printer'}, and *model* is the key of the database relations.

A. Implement the database using a RDBS of your choice.
B. Provide SQL queries that produce the violations of the following constraints:

   a. No manufacturer of PCs may also make laptops.
   b. A manufacturer of a PC must also make a laptop with at least as great a processor.
   c. If a laptop has a larger main memory than a PC, then the laptop must have a higher price than the PC.
   d. If the relation Products mentions a model and its type, then the model must also appear in the relation appropriate to that type.

   Show the outputs of your queries using the sample data provided in the textbook.

C. Use CREATE FUNCTION and ALTER TABLE to implement the constraints in B into the database schema. Discuss the association of the functions created with the database relations and indicate the outcome for the sample data provided.

D. Use CREATE PROCEDURE to implement the constraints in B and indicate the outcome for the sample data provided.

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[1] Jeffrey D. Ullman and Jennifer Widom, *A First Course in Database Systems – Third Edition*, Pearson.

E. It is generally recommended that database constraints must be satisfied at statement boundaries, so that relations are never allowed to include any inconsistencies. However, the conventional wisdom is that a multi-relation constraint checking, at least two different attributes at different relations, has to be deferred to commit time. Consider the constraint B.*c*:

a. Show how UPDATEs of the **PCs** and **Laptops** relations may fail under immediate checking.
b. Write a TRANSACTION to bundle up the two UPDATEs of the **PCs** and **Laptops** relations. Specify the appropriate type and isolation level of the TRANSACTION.
c. Discuss the atomicity problems, if any, that could occur should the system crash between the two updates.

Best wishes

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1 November 2021