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07–13-2023

COMP 5120

Homework 2

1. What is a foreign key constraint? Why are such constraints important? What is

referential integrity? (10 pts)

* A foreign key is a set of fields that establishes a relationship in one column or multiple child columns to a primary key column. It is important because it maintains data integrity and ensures that the values of the child columns and the primary columns always correspond.
* Referential integrity ensures that the relationships between the tables are valid.

2. Explain the difference between external, internal, and conceptual schemas. How

are these different schema layers related to the concepts of logical and physical

data independence? (10 pts)

* External schema
  + Describes the part of the database that a specified group is interested in and keeps the data from other groups.
* Internal schema
  + Describes the databases’ physical storage structure. It uses a physical data model.
* Conceptual schema
  + Describes the entire database for a community or users. Hiding the details and focuses on describing entities, datatypes, relationships, constraints, and user operations.
* These layers do not overlap in terms of logical and physical data independence. Physical data independence exists between physical (internal) level and logical (conceptual) level which can modify the internal schema without having to modify the conceptual schema as well. The logical independence works similar to the physical data independence as it rests between the logical level and the external level; it can modify the logical schema without having to modify the external schema.

3. Consider the following schema:

Suppliers (sid: integer, sname: string, address: string)

Parts (pid: integer, pname: string, color: string)

Catalog (sid: integer, pid: integer, cost: real)

The Catalog relation lists the prices charged for parts by suppliers. Write the

following queries in SQL (40 pts):

1. SELECT pname FROM Parts;
2. SELECT Suppliers.sname

FROM Suppliers, Parts, Catalog

WHERE Suppliers.sid = Catalog.sid

AND Parts.pid = Catalog.pid

AND cost = (

SELECT MAX(Catalog.cost)

WHERE Catalog.pid = Parts.pid);

1. SELECT Suppliers.sid

FROM CataloCatalog, Parts, Suppliers

WHERE Suppliers.sid = Catalog.sid

AND Parts.pid = Catalog.pid

AND Parts.color = "Red";

1. SELECT Suppliers.sname

FROM Suppliers

INNER JOIN Catalog

ON Supplier.sid = Catalog.sid

GROUP BY Suppliers.sname

HAVING COUNT (Catalog.pid) = (

SELECT COUNT (pid)

FROM Parts

4. Consider the following schema:

Employee (person-name, street, city)

Works (person-name, company-name, salary)

Company (company-name, city)

Manages (person-name, manager-name)

Write the following queries in relational algebra (40 pts):

1. Πename(σcompany =aubank(employees ⋈ works)
2. Πename, city(σcompany=aubank (employees ⋈ works)
3. Πename, city, street((σcompany=aubank (employees ⋈ works)) ⋂ salary > 50,000)
4. Πenames(σcompany=works.company (employees ⋈ company ⋈ works)