
1. Why would you choose a database system instead of simply storing data in operating system files? When would it make sense not to use a database system?

2. Drugwarehouse.com has offered you a free life-time supply of prescription drugs (no questions asked) if you design its database schema. Given the rising cost of health care, you agree. Here is the information that you gathered:

- Patients are identified by their SSN, and we also store their names and age.
- Doctors are identified by their SSN, and we also store their names and specialty.
- Each patient has one primary care physician, and we want to know since when the patient has been with her primary care physician.
- Each doctor has at least one patient.

- a) Draw an ER diagram that captures the above information
- b) Write the DDLs for the ER diagram you have drawn. Include primary and foreign key constraints. You may assume any reasonable data types.

3. Consider the following schema:

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Suppliers(SID integer, sname varchar(40), address varchar(40))
Parts(PID integer, pname varchar(40), color varchar(40))
Catalog(SID integer, PID integer, price real)
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The Suppliers relation describes suppliers of parts. The Parts relation contains information about each part. The Catalog relation lists the prices in dollars charged for parts by suppliers. (The keys are uppercase: sid is a key for Suppliers, (sid,pid) is a key for Catalog, and pid is a key for Parts.) Write the following queries in relational algebra.

- a) Find the names of suppliers who supply all blue parts.
- b) Find the names of suppliers who supply two or more parts.
- c) Find the names of parts that do not have a supplier.
- d) Find the names of parts that have exactly one supplier.

4. Consider the relation Stocks(B,O,I,S,Q,D), whose attributes may be thought of informally as broker, office (of the broker), investor, stock, quantity (of the stock owned by the investor), and dividend (of the stock). Let the set of FD's for Stocks be $\{S \rightarrow D, I \rightarrow B, IS \rightarrow Q, B \rightarrow O\}$

- a) What are all the keys for Stocks ?
 - b) What normal forms (BCNF or 3NF) does Stocks conform to ? (If not, indicate violating FDs).
 - c) Decompose Stocks into the strongest normal form so that the decomposition is both lossless join and dependency preserving.
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