Normalization Exercises

Wholesale Dealer

Consider the following relation that keeps track of the sales of a wholesale dealer in trousers:

TrousersSold(customerID, customerName, model, size, day, numberSold, price)

Suppose the following functional dependencies hold on the relation:

$$
\begin{aligned}
\text{customerID} &\rightarrow \text{customerName} \\
\text{customerID, model, size, day} &\rightarrow \text{numberSold} \\
\text{model, size} &\rightarrow \text{price} \\
\text{model, price} &\rightarrow \text{size}
\end{aligned}
$$

(i) Decompose the relation in smaller relations such that

   – each of the smaller relations is in BNCF with respect to the projection of the original dependencies;

   – the decomposition is a lossles join decomposition.

(ii) Is your decomposition dependency preserving? If your answer is "yes", argue why. If your answer is "no", show which dependencies have been lost.

Manufacturing

Consider the following relation that keeps track of the orders placed by a manufacturing company:

   Orders(orderDate, deliveryDate, supplier, partID, material, price).

Suppose the following functional dependencies hold on the relation:

$$
\begin{aligned}
\text{orderDate, supplier} &\rightarrow \text{deliveryDate} \\
\text{partID, supplier, orderDate} &\rightarrow \text{price} \\
\text{partID} &\rightarrow \text{material} \\
\text{material} &\rightarrow \text{supplier.}
\end{aligned}
$$

(i) Decompose the relation in smaller relations such that

– each of the smaller relations is in BNCF with respect to the projection of the original dependencies;

– the decomposition is a lossless join decomposition.

(ii) Is your decomposition dependency preserving? If your answer is "yes", argue why. If your answer is "no", show which dependencies have been lost.

Exam Administration

Consider the following relation that keeps track of the exams taken by students at a University department:

Exam(studID, studName, courseID, courseTitle, acadYear,
                        examSession, mark, degreeCourse)

Suppose the following functional dependencies hold on the relation:

$$
\begin{aligned}
\text{studID} &\rightarrow \text{studName, degreeCourse} \\
\text{courseID} &\rightarrow \text{courseTitle} \\
\text{studID, courseID, acadYear, examSession} &\rightarrow \text{mark} \\
\text{studID, courseID} &\rightarrow \text{acadYear, examSession}
\end{aligned}
$$

(i) Decompose the relation in smaller relations such that

– each of the smaller relations is in BNCF with respect to the projection of the original dependencies;

– the decomposition is a lossless join decomposition.

(ii) Is your decomposition dependency preserving? If your answer is "yes", argue why. If your answer is "no", show which dependencies have been lost.