EXERCISE

Given the following relational schema:

PROVIDES(Name_P, Product, Price)
ORDER(Order#, Date, Customer#)
INFO_ORD(Order#, Product, Quantity)
CUSTOMER(Customer#, Name, City)

where key attributes have been underlined and common attributes between tables provide formal links (foreign keys). Answer the following questions:

a) Can a provider provide more than one product?
b) Can a given product be sold at different prices?
c) Can two different orders with same number exist?
d) Can a given product appear in two different orders?
e) Express the following queries in relational algebra:
    1. Find the names of customers from Dublin that ordered Brie in 1999;
    2. Find the names of customers from Dublin that ordered both Brie and Parmesan Cheese in 1999;
    3. Find the names of customers that have ordered only Brie (i.e. all orders containing such customers contain Brie as product);

SOLUTIONS

a) Yes
b) Yes, as long as it is sold by different providers
c) No
d) Yes

e.1) $\pi_{Name}(\sigma_F$ (CUSTOMER⋈ORDER ⋈ INFO_ORD))

where:
F = Date<01/01/2000 AND Date>31/12/1998 AND
City= ‘Dublin’ AND Product= ‘Brie’

e.2) R= $\pi_{Name,Customer\#}$ (σ_F (CUSTOMER⋈ORDER ⋈ INFO_ORD))

where:
F = (Date<01/01/2000 AND Date>31/12/1998) AND
City= ‘Dublin’ AND Product= ‘Brie’

R_1 = $\pi_{Name,Customer\#}$ (σ_{F1} (CUSTOMER⋈ORDER⋈ INFO_ORD))

where:
F1 = Date<01/01/2000 AND Date>31/12/1998 AND
City= ‘Dublin’ AND Product= ‘Parmesan’

Final result is π_{Name} (R ∩ R_1)

e.3)

$R = \pi_{Name,\ Customer\#}\ (\sigma_{Product = \text{‘Brie’}}\ CUSTOMER \bowtie ORDER \bowtie INFO\_ORD)$

$R_1 = \pi_{Name,\ Customer\#}\ (\sigma_{Product <> \text{‘Brie’}} CUSTOMER \bowtie ORDER \bowtie INFO\_ORD)$

Final result is $\pi_{Name}\ (R\ -\ R_1)$