No.

Database Systems

10. Write queries using relational algebra to request the information that the following textbook exercise problems are asking: Exercise 2.4.1 a, b, c, d, e, f, g, h, i (Book Chapter 2 Exercise 4.1)

a) (sample) What PC models have a speed of at least 2.50?

a. $R1 := \sigma_{speed \geq 2.50}(PC)$
$R2 := \pi_{model}(R1)$

model	speed
1001	2.66
1004	2.80
1005	3.20
1006	3.20
1010	2.80
1012	2.80
1013	3.06

$\sigma_{speed \geq 2.50}(PC)$

<Answer>
Model 1001, 1004
1005, 1006
1010, 1012
1013

<explanation>
look the Sample data for relation PC Chart (a) — R1
R2 : list of PC models

b) (3pt) Which manufacturer make laptops with a hard disk of at least 120GB?

<explanation>
According to the Sample data for relation Laptop Chart(b)
$R1 := \sigma_{hd \geq 120}(Laptop)$
$R2 := Product \bowtie (R1)$

model	hd
2001	240
2005	120
2007	120
2010	160

Sample data for Product chart (Figure 20)

maker	model
E	2001
A	2005
B	2007
G	2010

$R3 := \pi_{maker}(R2)$

<Answer>
$R1 := \sigma_{hd \geq 120}(laptop)$
$R2 := Product \bowtie (R1)$
$R3 := \pi_{maker}(R2)$
Maker E, A, B G

c) Find the model number and price of all products (of any type) made by manufacturer C.

<explanation & Answer>

Find the common data maker C of the tables Product ← PC, Laptop, Printer

$R1 := \sigma_{maker = C}(Product \bowtie PC)$

$R2 := \sigma_{maker = C}(Product \bowtie Laptop)$

$R3 := \sigma_{maker = C}(Product \bowtie Printer)$

$R4 := \pi_{model, price}(R1)$

$R5 := \pi_{model, price}(R2)$

$R6 := \pi_{model, price}(R3)$

$R7 := R4 \cup R5 \cup R6$

Sample data for Product Chart

maker	type	model
C	PC	1001 → R1

Sample data for relation PC

model	price
1001	510 → R4

Result of query

model	price
1001	510

Answer: model number - 1001
price - 510

d) Find the model numbers of colorless laser printers.

<explanation & Answer>

$R1 := \sigma_{color = false \text{ AND } type = laser}(Printer)$

$R2 := \pi_{model}(R1)$

Answer: model numbers - 3002, 3005

Sample data for relation Printer(d)

model	color	type
3002	false	laser
3005	false	laser

⇒ R1

e) Find those manufacturers that sell Printer, but not PC's.

<explanation & Answer>

$R1 := \sigma_{type = printer}(Product)$

$R2 := \sigma_{type = PC}(Product)$

$R3 := \pi_{maker}(R1)$

$R4 := \pi_{maker}(R2)$

$R5 := R3 - R4$

Sample data for product (Figure 20)

maker	type
D	printer
E	Printer
H	Printer

maker	type
A	PC
B	PC
C	PC
D	PC
E	PC

Answer: H maker sells Printer, but not PC.

f) Find those hard-disk sizes that occur in two or more PCs.

<explanation & Answer>

$R1 := \rho_{PC1}(PC)$

$R2 := \rho_{PC2}(PC)$

$R3 := R1 \bowtie (PC1.hd = PC2.hd \text{ AND } PC1.model <> PC2.model) R2$

$R4 := \pi_{hd}(R3)$

Sample data for relation PC (a)

model	hd
1001	250
1002	250
1004	250
1005	250
1008	250
1009	250
1003	80
1013	80
1011	160
1012	160
1006	320
1007	200
1010	300

R4 → hd-250, 80, 160

g.) Find those pairs of PC models that have both the same speed and RAM. A pair should be listed only once; e.g., list(i,j) but not (j,i)

<explanation & Answer>

Sample data for relation PC

model	speed	ram
1004	2.80	1024
1012	2.80	1024

$R1 := \rho_{PC1}(PC)$

$R2 := \rho_{PC2}(PC)$

$R3 := R1 \bowtie_{PC1.speed = PC2.speed \text{ AND } PC1.ram = PC2.ram \text{ AND } PC1.model < PC2.model} R2$

$R4 := \pi_{PC1.model, PC2.model}(R3)$

(i,j) = (j,i) listed only once, i<j

model 1004 & model 1012 Pair

h.) Find those manufacturers of at least two different computers (PCs or laptop) with speeds of at least 2.20.

<explanation & Answer>

$R1 := \pi_{model}(\sigma_{speed \geq 2.20}(PC)) \cup \pi_{model}(\sigma_{speed \geq 2.20}(laptop))$

⇒ None

⇒ Sample data for relation PC

model	speed
1001	2.66
1004	2.80
1005	3.20
1006	3.20
1007	2.20
1008	2.20
1010	2.80
1012	2.80
1013	3.06

$R2 := \pi_{maker, model}(R1 \bowtie Product)$

$R3 := \rho_{R3(maker2, model2)}(R2)$

$R4 := R2 \bowtie_{(maker = maker2 \text{ AND } model \neq model2)} R3$

$R5 := \pi_{maker}(R4)$

Sample data for Product

maker	model
A	1001
B	1004
B	1005
B	1006
C	1007
D	1008
D	1010
E	1012
E	1013

Maker B, D, E are at least 2 different Computers with speeds of at least 2.20.

i) Find the manufacturers of PC's with at least three different speeds.

<explanation & Answer>

Sample data for Product & PC

maker	model	speed
A	1001	2.66
A	1002	2.10
A	1003	1.42
D	1008	2.20
D	1009	2.00
D	1010	2.80
E	1011	1.86
E	1012	2.80
E	1013	3.06

$R1 := \pi_{maker, speed}(Product \bowtie PC)$

$R2 := \rho_{R2(maker2, speed2)}(R1)$

$R3 := \rho_{R3(maker3, speed3)}(R1)$

$R4 := R1 \bowtie_{(maker = maker2 \text{ AND } speed <> speed2)} R2$

$R5 := R4 \bowtie_{(maker3 = maker \text{ AND } speed <> speed3)} R3$

$R6 := \pi_{maker}(R5)$

Maker A, D, E are at least 3 different speeds of PCs.