B461 A6

BY MATTHEW PLOETZ

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A)

$\pi_{S.\text{Sid},B1.\text{BookNo}}(\sigma_{S.\text{Sid}=b1.\text{Sid AND } S.\text{Sid}=B2.\text{Sid AND } B1.\text{BookNo}!=B2.\text{BookNo AND } S.\text{Sname}='\text{Eric}' \text{ AND } b1.\text{BookNo}!=2010}(S \times B1 \times B2))$

B)

SELECT DISTINCT b.bookno, b.title FROM book b, student s WHERE b.price = SOME(select b1.price from buys t, book b1 where b1.price > 50 and s.sid = t.sid and t.bookno = b1.bookno);

SOME(select $b1$.price from buys t, book $b1$ where $b1$.price $>$ 50 and s.sid $=$ t.sid and t.bookno $=$ $b1$.bookno)

$\longrightarrow$

Exists(select $b1$.price from buys t, book $b1$ where $b1$.price $>$ 50 and s.sid $=$ t.sid and t.bookno $=$ $b1$.bookno)

$\longrightarrow$

$\pi_{B1.\text{Price}}(\sigma_{B1.\text{Price}>50 \text{ AND } S1.\text{Sid}=T.\text{Sid AND } T.\text{BookNo}=B1.\text{BookNo}}(T \times B1 \times S1))$

$\longrightarrow$

$(S \times B \ltimes (\pi_{S1.\text{Sname},S1.\text{Sid}}(\sigma_{B1.\text{Price}>50 \text{ AND } S1.\text{Sid}=T.\text{Sid AND } T.\text{BookNo}=B1.\text{BookNo}}(T \times B1 \times S1))))$

$\longrightarrow$

$\pi_{B.\text{BookNo},B.\text{Title}}($

$(S \times B) \ltimes_{B.\text{Price}=B1.\text{Price}} (\pi_{B2.\text{Price}}(\pi_{S1.\text{Sname},S1.\text{Sid}}(\sigma_{B1.\text{Price}>50 \text{ AND } S1.\text{Sid}=T.\text{Sid AND } T.\text{BookNo}=B1.\text{BookNo and } B2.\text{Price}=B1.\text{Price}}(T \times B1 \times S1 \times B2)))))$

C)

SELECT b.bookno FROM book b WHERE b.bookno IN (SELECT b1.bookno FROM book b1 WHERE b1.price > 50) UNION (SELECT c.bookno FROM cites c);

$\longrightarrow$

select b.bookno from book b where exists(select b1.bookno from book b1 where b1.price > 50 and b.bookno = b1.bookno) union (select c.bookno from cites c)

$\longrightarrow$

Sub1:

$\pi_{B1.\text{BookNo}}(\sigma_{B1.\text{Price}>50 \text{ AND } B.\text{BookNo}=B1.\text{BookNo}}(B1))$

Sub2:

$\pi_{C.\text{BookNo}}(C)$

$\longrightarrow$

$\pi_{B1.\text{BookNo}}(\sigma_{B1.\text{Price}>50 \text{ AND } B.\text{BookNo}=B1.\text{BookNo}}(B1)) \cup \pi_{C.\text{BookNo}}(C)$

$\longrightarrow$

$B \ltimes \pi_{B1.\text{BookNo}}(\sigma_{B1.\text{Price}>50 \text{ AND } B.\text{BookNo}=B1.\text{BookNo}}(B1)) \cup \pi_{C.\text{BookNo}}(C)$

$\longrightarrow$

$(B \ltimes (\pi_{B2.\text{BookNo}, B2.\text{Price}, B2.\text{Title}}(\sigma_{B1.\text{Price}>50 \text{ AND } B2.\text{BookNo}=B1.\text{BookNo}}(B1 \times B2)) \cup (\pi_{C.\text{BookNo}}(C))))$

$\longrightarrow$

$\pi_{B.\text{BookNo}}$

$(B \ltimes (\pi_{B2.\text{BookNo}, B2.\text{Price}, B2.\text{Title}}(\sigma_{B1.\text{Price}>50 \text{ AND } B2.\text{BookNo}=B1.\text{BookNo}}(B1 \times B2)) \cup (\pi_{C.\text{BookNo}}(C))))$

D)

SELECT b.bookno FROM book b WHERE b.price >= 80 and NOT EXISTS(SELECT b1.bookno FROM book b1 WHERE b1.Price > b.Price);

$\longrightarrow$

$\pi_{B1.\text{BookNo}}(\sigma_{B1.\text{Price}>B2.\text{Price}}(B2 \times B1))$

$\longrightarrow$

$\pi_{B2.\text{BookNo}, B2.\text{Title}, B2.\text{Price}}(\sigma_{B1.\text{Price}>B2.\text{Price}}(B2 \times B1))$

$\longrightarrow$

$\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80 \text{ and }}(B))\pi_{B2.\text{BookNo}, B2.\text{Title}, B2.\text{Price}}(\sigma_{B1.\text{Price}>B2.\text{Price}}(B2 \times B1))$

$\longrightarrow$

$\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80 \text{ and }}(B \bar{\ltimes} (\pi_{B2.\text{BookNo}, B2.\text{Title}, B2.\text{Price}}(\sigma_{B1.\text{Price}>B2.\text{Price}}(B2 \times B1)))$

$\longrightarrow$

$\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80}(B)) -$

$(\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80})(B \ltimes (\pi_{B2.\text{BookNo}, B2.\text{Title}, B2.\text{Price}}(\sigma_{B1.\text{Price}>B2.\text{Price}}(B2 \times B1)))$

E)

SELECT s.sid FROM Student s WHERE EXISTS(SELECT 1 FROM Book b WHERE b.price > 50 AND b.bookno IN (SELECT t.bookno FROM Buys t WHERE s.sid = t.sid AND s.sname = 'Eric'))

SELECT s.sid FROM Student s WHERE EXISTS(SELECT 1 FROM Book b WHERE b.price > 50 AND EXISTS(SELECT t.bookno FROM Buys t WHERE s.sid = t.sid AND s.sname = 'Eric' and b.bookno = t.bookno))

Sub3:

$\pi_{t.\text{BookNo}}(\sigma_{S1.\text{Sid}=t.\text{Sid and } s1.\text{Sname}='\text{Eric}'}(S1 \times T))$

$\pi_{t.\text{BookNo}}(\sigma_{S1.\text{Sid}=t.\text{Sid and } s1.\text{Sname}='\text{Eric}' \text{and } B1.\text{BookNo}}(S1 \times T \times B1))$

$(S \times B) \ltimes \pi_{t.\text{BookNo}}(\sigma_{S1.\text{Sid}=t.\text{Sid and } s1.\text{Sname}='\text{Eric}' \text{and } B1.\text{BookNo}}(S1 \times T \times B1))$

Sub2:

$\pi_{S1.\text{Sid}, S1.\text{Sname}}(\sigma_{B.\text{Price}>50 \text{ and } B.\text{BookNo}}(B) \ltimes \mathcal{E})$

$\longrightarrow$

$\pi_{S.\text{Sid}}(S) \ltimes_{S1.\text{Sid}=S.\text{Sid}} (\pi_{S1.\text{Sid}, S1.\text{Sname}}(\sigma_{B.\text{Price}>50 \text{ and } B.\text{BookNo}}(B) \ltimes \mathcal{E}))$

F)

SELECT s1.sid, s2.sid FROM student s1, student s2 WHERE s1.sid s2.sid AND˙NOT EXISTS(SELECT 1˙FROM Buys t1˙WHERE t1.sid = s1.sid AND˙t1.bookno NOT IN (SELECT t2.bookno˙FROM Buys t2˙WHERE t2.sid = s2.sid));

SELECT s1.sid, s2.sid FROM student s1, student s2 WHERE s1.sid s2.sid AND˙NOT EXISTS(SELECT 1˙FROM Buys t1˙WHERE t1.sid = s1.sid AND NOT EXISTS (SELECT t2.bookno˙FROM Buys t2˙WHERE t2.sid = s2.sid and t1.bookno = t2.bookno));

$T1 \bar{\ltimes} \pi_{t2.\text{BookNo}}(\sigma_{t2.\text{Sid}=S2.\text{Sid and } t1.\text{BookNo}=t2.\text{BookNo}}(T2))$

$\longrightarrow$

$(T1 \times S2) \ltimes \pi_{t2.\text{BookNo}}$

$(\sigma_{t2.\text{Sid}=S3.\text{Sid and } t3.\text{BookNo}=t2.\text{BookNo}}(T2 \times T3 \times S3) - \sigma_{t2.\text{Sid}=S2.\text{Sid and } t3.\text{BookNo}=t2.\text{BookNo}}(T2 \times T3 \times S3))$

$\longrightarrow$

$\pi_{s1.\text{Sid},S2.\text{Sid}}(\sigma_{S1.\text{Sid}!=S2.\text{Sid}}(S1 \times S2) - (S1 \times S2) \ltimes \pi_{t1.\text{Sid},T1.\text{BookNo}}(\sigma_{t1.\text{Sid}=s1.\text{Sid}}(S1 \times T1)) \ltimes \mathcal{E})$

2

A)

$\pi_{S.\text{Sid},B1.\text{BookNo}}(\sigma_{S.\text{Sid}=b1.\text{Sid AND } S.\text{Sid}=B2.\text{Sid AND } B1.\text{BookNo}!=B2.\text{BookNo AND } S.\text{Sname}='\text{Eric}' \text{ AND } b1.\text{BookNo}!=2010}(S \times B1 \times B2))$

$\longrightarrow$

Take out cross of buys and join them

$\pi_{B1.\text{Sid},B1.\text{BookNo}}(\sigma_{B1.\text{BookNo}!='2010'}(B1)) \ltimes_{B1.\text{BookNo}!=B2.\text{BookNo and } B1.\text{Sid}=B2.\text{Sid}} \pi_{B2.\text{Sid},B2.\text{BookNo}}(B2)$

$\longrightarrow$

$\pi_{S.\text{Sid},B1.\text{BookNo}}(\sigma_{S.\text{Sname}='\text{Eric}'}(S))$

$\longrightarrow$

$\pi_{S.\text{Sid},B1.\text{BookNo}}(\sigma_{S.\text{Sname}='\text{Eric}'}(S)) \ltimes_{S.\text{Sid}=B1.\text{Sid and } S.\text{Sid}=B2.\text{Sid}} \pi_{B1.\text{Sid},B1.\text{BookNo}}$

$(\sigma_{B1.\text{BookNo}!='2010'}(B1)) \ltimes_{B1.\text{BookNo}!=B2.\text{BookNo and } B1.\text{Sid}=B2.\text{Sid}} (B2)$

B)

$\pi_{B.\text{BookNo},B.\text{Title}}($

$(S \times B) \ltimes_{B.\text{Price}=B1.\text{Price}} (\pi_{B2.\text{Price}}(\pi_{S1.\text{Sname},S1.\text{Sid}}(\sigma_{B1.\text{Price}>50 \text{ AND } S1.\text{Sid}=T.\text{Sid AND } T.\text{BookNo}=B1.\text{BookNo and } B2.\text{Price}=B1.\text{Price}} (T B1 \times S1 \times B2)))))$

$\longrightarrow$

Pull out books

$\pi_{B1.\text{BookNo},B1.\text{Price}}(\sigma_{B1.\text{Price}>50}(B1))$

$\pi_{T.\text{Sid},B1.\text{Price}}(T) \ltimes_{T.\text{BookNo}=B1.\text{BookNo}} (\pi_{B1.\text{Price},B1.\text{BookNo}}(\sigma_{B1.\text{Price}>50}(B1)))$

$\longrightarrow$

Combine B1,T and S1

$\pi_{B1.\text{Price}}(\sigma_{S1.\text{Sid}}(S1)) \ltimes_{S1.\text{Sid}=T.\text{Sid}} \pi_{T.\text{Sid},B1.\text{Price}}(T) \ltimes_{T.\text{BookNo}=B1.\text{BookNo}} (\pi_{B1.\text{BookNo},B1.\text{Price}}(\sigma_{B1.\text{Price}>50}(B1)))$

$\longrightarrow$

Reducing

Same Books bought

$\pi_{B.\text{BookNo},B.\text{Title}}(B) \ltimes_{B.\text{Price}=B1.\text{Price}} (\pi_{B1.\text{Price}}(T) \ltimes_{T.\text{BookNo}=B1.\text{BookNo}} (\pi_{B1.\text{BookNo},B1.\text{Price}}(\sigma_{B1.\text{Price}>50}(B1))))$

C)

$\pi_{B.\text{BookNo}}$

$(B \ltimes (\pi_{B2.\text{BookNo},B2.\text{Price},B2.\text{Title}}(\sigma_{B1.\text{Price}>50 \text{ AND } B2.\text{BookNo}=B1.\text{BookNo}}(B1 \times B2)) \cup (\pi_{C.\text{BookNo}}(C))))$

$\longrightarrow$

$\pi_{B1.\text{BookNo}}(\sigma_{B1.\text{Price}>50}(B1))$

$\longrightarrow$

$\pi_{C.\text{BookNo}}(C)$

$\longrightarrow$

Reducing to less Union

$\pi_{B.\text{BookNo}}(\pi_{B1.\text{BookNo}}(\sigma_{B1.\text{Price}>50}(B1)) \cup \pi_{C.\text{BookNo}}(C))$

D)

$\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80}(B)) -$

$(\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80})(B \ltimes (\pi_{B2.\text{BookNo},B2.\text{Title},B2.\text{Price}}(\sigma_{B1.\text{Price}>B2.\text{Price}}(B2 \times B1)))$

$\longrightarrow$

$\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80}(B)) \cap (\pi_{B2.\text{BookNo},B2.\text{Title},B2.\text{Price}}(\sigma_{B1.\text{Price}>B2.\text{Price}}(B2 \times B1)))$

$\longrightarrow$

$\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80}(B)) -$

$\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80}(B)) \cap (\pi_{B2.\text{BookNo},B2.\text{Title},B2.\text{Price}}(\sigma_{B1.\text{Price}>B2.\text{Price}}(B2 \times B1)))$

$\longrightarrow$

Which is same as saying $\varnothing \cup \mathcal{E}$ so we can say

$\pi_{B.\text{BookNo}}(\sigma_{B.\text{Price}\geq 80}(B)) -$

$\pi_{B2.\text{BookNo}}(B1) \ltimes_{B1.\text{Price}>B2.\text{Price}} (B2)$

3

A)

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WITH
E1 AS (SELECT S.Sid FROM Student S WHERE S.Sname = 'Eric'),
E2 AS (SELECT B1.BookNo, B1.Sid FROM Buys B1 WHERE B1.BookNo != '2010'),
E3 AS (SELECT E2.BookNo,E2.Sid FROM E2 INNER JOIN Buys B ON (E2.Sid = B.Sid AND
E2.BookNo != B.BookNo)),
E4 AS (SELECT E3.Sid, E3.BookNo FROM E3 INNER JOIN E3 ON (E3.Sid = E1.Sid))
SELECT * FROM E4;
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