

## Problem Set #1 Sample Solution

Problem1·

(a) Flight.ald is the foreign key reference to Airline.ald

Flight.OriginAp is the foreign key reference to Airport.apCode

Flight.destinAp is the foreign key reference to Airport.apCode

Books.pld is the foreign key reference to Passenger.pld

Books.(fnum,deptdate) is the foreign key reference to Flight.(fnum, deptdate)

(b)

I. SELECT pName

FROM Passenger NATURAL JOIN Books NATURAL JOIN Flight

WHERE originAp in (SELECT apCode FROM Airport WHERE apCountry =  
'Japan')

AND destinAp in (SELECT apCode FROM Airport WHERE apCountry = 'United  
States')

AND deptdate = '2018-11-5';

II. WITH tem AS (

SELECT pName, pld, fnum, deptdate, deptTime, arrTime

FROM Books NATURAL JOIN Flight NATURAL JOIN Passenger);

SELECT a.pName

FROM tem a, tem b

WHERE a.pld = b.pld AND a.deptdate = b.deptdate

AND 0 < hour(b.deptTime) - hour(a.arrTime)

AND hour(b.deptTime) - hour(a.arrTime) < 1;

III.

SELECT destinAp, COUNT(distinct pld) AS num

FROM Books RIGHT OUTER JOIN Flight ON Books.fnum=Flight.fnum AND

Books.deptdate=Flight.deptdate

WHERE originAp = 'JFK' AND year(deptTime) = 2017

GROUP BY destinAp,originAp;

IV.

SELECT aName

FROM Books NATURAL JOIN Flight NATURAL JOIN Airport NATURAL JOIN Airline

WHERE year(deptdate) = 2017

GROUP BY ald, aName

ORDER BY COUNT(\*) DESC

LIMIT 1

V.

SELECT a.pName

FROM (SELECT pld, pName, COUNT(\*) AS numofbook

FROM Books NATURAL JOIN Flight NATURAL JOIN Passenger

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WHERE year(deptdate) = 2017
      AND originAp in (SELECT apCode FROM Airport WHERE apCountry =
'Japan')
      AND destinAp in (SELECT apCode FROM Airport WHERE apCountry =
'United States')
      GROUP BY pld, pName) a
WHERE a.numofbook >= 2;

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VI.

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SELECT b1.pld, b2.pld
FROM Books b1, Books b2
WHERE b1.pld < b2.pld AND b1.fnum = b2.fnum AND b1.deptdate = b2.deptdate
AND year(b1.deptdate) = 2017
GROUP BY b1.pld, b2.pld
HAVING count(*) = (SELECT count(*) FROM Books WHERE year(deptdate) = 2017
AND pld = b1.pld)
      AND count(*) = (SELECT count(*) FROM Books WHERE year(deptdate) = 2017
AND pld = b2.pld)

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VII.

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(SELECT distinct f2.destinAp as apCode
FROM Flight f1, Flight f2
WHERE f1.destinAp = f2.originAp AND f1.originAp = 'JFK' AND f2.destinAp <> 'JFK')
UNION
(SELECT distinct destinAp as apCode
FROM Flight
WHERE originAp = 'JFK')

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(c)Answer:

$$\begin{aligned}
 1. & JP \leftarrow \Pi_{apCode \text{ as } jpAp} \sigma_{apCountry = \text{"Japan"}} (Airport) \\
 & US \leftarrow \Pi_{apCode \text{ as } usAp} \sigma_{apCountry = \text{"USA"}} (Airport) \\
 T & \leftarrow \Pi_{fnum, deptdate} \sigma_{Flight.originAp = Jp.jpAp \text{ AND } Flight.destinAp = Us.usAp \text{ and } year(deptdate) = 2017} (Flight \times JP \times US) \\
 & \Pi_{pName} (Passengers \bowtie Books \bowtie T) \\
 2. & T \leftarrow \Pi_{pName, pId, fnum, deptdate, deptTime, arrTime} (Books \bowtie Flight \bowtie Passengers) \\
 & \Pi_{pName} \sigma_{Hour(b.deptTime - a.arrTime) > 0 \text{ AND } Hour(b.deptTime - a.arrTime) < 1} (T \bowtie a.FpID = b.pID \text{ AND } a.deptdate = b.deptdate \text{ } T \bowtie b) \\
 3. & \text{destinAp } G_{COUNT(*) \text{ as result}} (\sigma_{originAp = \text{"JFK"} \text{ AND } YEAR(deptdate) = 2017} (Books \bowtie Flight)) \\
 4. & T \leftarrow \Pi_{aID} G_{COUNT(*) \text{ as Sum}} (\sigma_{YEAR(Books.deptdate) = 2017} (Books \bowtie Flight)) \\
 & M \leftarrow G_{MAX(Sum) \text{ as Maximum}} (T) \\
 & \Pi_{aName} \sigma_{Sum = Maximum} (Airline \bowtie T \times M)
 \end{aligned}$$

$$\begin{aligned}
5. & JP \leftarrow \Pi_{apCode \text{ as } jpAp} \sigma_{apCountry = \text{"Japan"}} (Airport) \\
& US \leftarrow \Pi_{apCode \text{ as } usAp} \sigma_{apCountry = \text{"USA"}} (Airport) \\
& T \leftarrow \Pi_{fnum, deptime} \sigma_{Flight.originAp = Jp.jpAp \text{ AND } Flight.destinAp = Us.usAp \text{ and } year(deptime) = 2017} (Flight \times JP \times US) \\
& \Pi_{pName} \sigma_{countNum \geq 2} (pID, pName G_{count(*)} \text{ as } countNum (Passengers \bowtie Books \bowtie T)) \\
6. & T1 \leftarrow \sigma_{year(b1.deptime) = 2017} (Books \bowtie b1 \bowtie b1.fnum = b2.fnum \text{ AND } b1.deptime = b2.deptime \text{ and } b1.pID < b2.pID Books \bowtie b2) \\
& T2 \leftarrow b1.pID, b2.pID G_{COUNT(*)} \text{ as } sum (T1) \\
& \Pi_{b1.pID, b2.pID} \sigma_{sum = (G_{COUNT(*)} \text{ as } sum1 (\sigma_{year(deptime) = 2017 \text{ AND } pID = b1.pID} (Books))) \text{ AND } sum = (G_{COUNT(*)} \text{ as } sum2 (\sigma_{year(deptime) = 2017 \text{ AND } pID = b2.pID} (Books)))} (T2) \\
7. & T1 \leftarrow \Pi_{destinAp \text{ as } des1} \sigma_{originAp = \text{"JFK"}} (Flight) \\
& T2 \leftarrow \Pi_{destinAp \text{ as } des2} \sigma_{Flight.originAp = T1.des1} (Flight \times T1) \\
& \Pi_{apCode} \sigma_{apCode = des1 \text{ OR } apCode = des2 \text{ AND } apCode \neq \text{"JFK"}} (Airport \times T1 \times T2)
\end{aligned}$$

(d) Answer:

1.

{t |  $\exists p \in \text{Passenger} (t[pName] = p[pName] \wedge$   
 $\exists b \in \text{Books} (b[pID] = p[pID] \wedge b[deptime] = \text{"2018-11-05"} \wedge$   
 $\exists f \in \text{Flight} (b[fnum] = f[fnum] \wedge b[deptime] = f[deptime] \wedge$   
 $\exists a1 \in \text{Airport} (a1[apCode] = f[originAp] \wedge a1[apCountry] = \text{"Japan"} \wedge$   
 $\exists a2 \in \text{Airport} (a2[apCode] = f[originAp] \wedge a2[apCountry] = \text{"United States"}))))))\}$

2.

{t |  $\exists p \in \text{Passenger} (t[pName] = p[pName] \wedge$   
 $\exists b1 \in \text{Book} (p[pID] = b1[pID] \wedge$   
 $\exists b2 \in \text{Book} (p[pID] = b2[pID] \wedge b1[deptime] = b2[deptime] \wedge$   
 $\exists f1 \in \text{Flight} (f1[fnum] = b1[fnum] \wedge f1[deptime] = b1[deptime] \wedge$   
 $\exists f2 \in \text{Flight} (f2[fnum] = b2[fnum] \wedge f2[deptime] = b2[deptime] \wedge$   
 $\text{hour}(f1[deptTime]) - \text{hour}(f2[arrTime]) > 0 \wedge$   
 $\text{hour}(f1[deptTime]) - \text{hour}(f2[arrTime]) < 1))))))\}$

3.

Can't express it in TRC or DRC due to the aggregation function.

4.

Can't express it in TRC or DRC due to the aggregation function.

5.

{t |  $\exists p1 \in \text{Passenger} (t[pName] = p1[pName] \wedge$   
 $\exists b1 \in \text{Books} (b1[pID] = p1[pID] \wedge \text{year}(b1[deptime]) = \text{"2017"} \wedge$   
 $\exists f1 \in \text{Flight} (b1[fnum] = f1[fnum] \wedge b1[deptime] = f1[deptime] \wedge$   
 $\exists a1 \in \text{Airport} (a1[apCode] = f1[originAp] \wedge a1[apCountry] = \text{"Japan"} \wedge$   
 $\exists a2 \in \text{Airport} (a2[apCode] = f1[originAp] \wedge a2[apCountry] = \text{"United States"}))$

2.

Select Property.pid, pstname, pstnum  
From Property natural join Openhouse  
Where pneighbor = "Park Slope" AND odate = "2018-10-10"

3.  
Select distinct cname  
From Consumer natural join Reserve natural join Openhouse  
Where aid=61734