Lab 12

1. **[3] Calculate the cost of the three strategies listed below if the *Staff* relation has 10000 tuples, *Branch* has 500 tuples, there are 500 Managers (one for each branch) and there are 10 London branches.**

   Three equivalent RA queries are:

a. $\sigma_{(position='Manager') \wedge (city='London') \wedge (Staff.branchNo=Branch.branchNo)} (Staff \times Branch)$
Ans:-
   1. Read staff = 10000
   2. Read branch = 500
   3. X write = 10000*500
   4. Read = 10000*500

      =10000+500+2*(10000*500)
      =100010500

b. $\sigma_{(position='Manager') \wedge (city='London')} (Staff \bowtie_{Staff.branchNo=Branch.branchNo} Branch)$
Ans:-
   1. Read staff = 10000
   2. Read branch = 500
   3. $\bowtie$ write = 10000
   4. Read = 10000

      =2*10000+(10000+500)
      =30500

c. $(\sigma_{(position='Manager')} (Staff)) \bowtie_{Staff.branchNo=Branch.branchNo} (\sigma_{(city='London')} (Branch))$
Ans:-
   1. Read staff = 10000
   2. Write 500
   3. Read branch = 500
   4. Write = 10
   5. Read = 500+10

      =10000+500+2*(500+10)
      =11520

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2. **[3] Using the Hotel schema given below, determine whether the following queries are syntactically and/or semantically correct.**
   Hotel (<u>hotelNo</u>, hotelName, city)
   Room (<u>roomNo</u>, <u>hotelNo</u>, type, price)
   Booking (<u>hotelNo</u>, guestNo, dateFrom, dateTo, roomNo)

Guest (<u>guestNo</u>, guestName, guestAddress)

(a) SELECT r.type, r.price
FROM Room r, Hotel h
WHERE r.hotel_number = h.hotel_number AND
h.hotel_name = 'Grosvenor Hotel' AND
r.type > 100;

Ans:- -Not semantically correct
-hotel_number and hotel_name is not correct and should be hotelNo and hotelName.
- type is not a numeric value.

(b) SELECT g.guestNo, g.name
FROM Hotel h, Booking b, Guest g
WHERE h.hotelNo = b.hotelNo AND h.hName = 'Grosvenor Hotel';

Ans:- -Not semantically correct
- h.hname is not correct and should be hotelName.
- g.name is not available in the table.

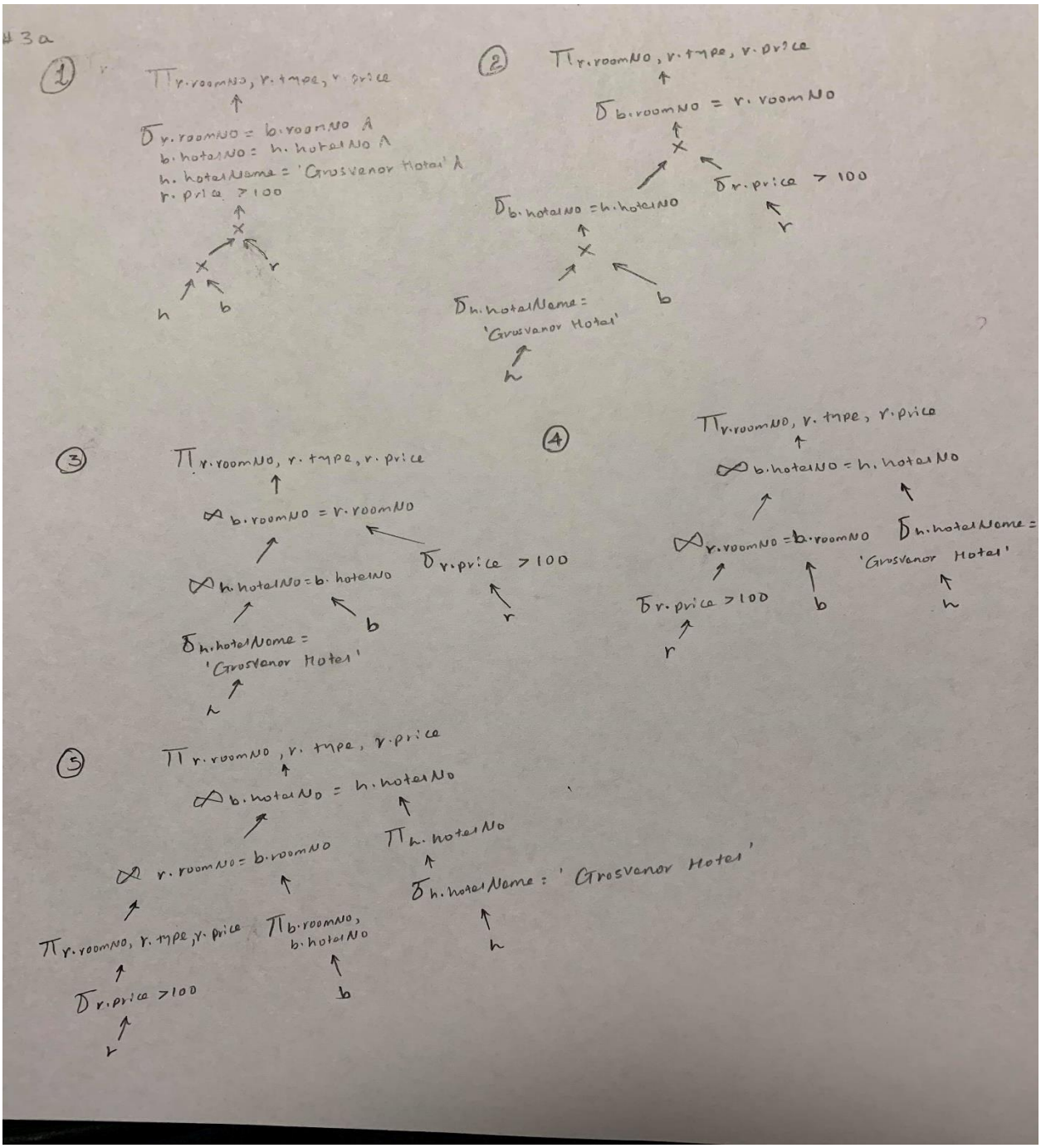
(c) SELECT r.roomNo, h.hotelNo
FROM Hotel h, Booking b, Room r
WHERE h.hotelNo = b.hotelNo AND h.hotelNo = 'H21' AND
b.roomNo = r.roomNo AND type = 'S' AND b.hotelNo = 'H22';

Ans:- -Not semantically correct
- hotelNo should be a numeric value.
- room is not related to a

3. **[4] Using the same Hotel schema, draw a relational algebra tree for each of the following queries and use the heuristic rules given in Section 23.3.2 to transform the queries into a more efficient form:**

(a)
```
SELECT r.roomNo, r.type, r.price
FROM Room r, Booking b, Hotel h
WHERE r.roomNo = b.roomNo AND b.hotelNo = h.hotelNo AND
        h.hotelName = 'Grosvenor Hotel' AND r.price > 100;
```

Ans:-


#3a
(1)
$\Pi_{r.roomNo, r.type, r.price}$
$\sigma_{r.roomNo = b.roomNo \wedge b.hotelNo = h.hotelNo \wedge h.hotelName = 'Grosvenor Hotel' \wedge r.price > 100}$
×
h
b
r
(2)
$\Pi_{r.roomNo, r.type, r.price}$
$\sigma_{b.roomNo = r.roomNo}$
×
$\sigma_{r.price > 100}$
r
$\sigma_{b.hotelNo = h.hotelNo}$
×
b
$\sigma_{h.hotelName = 'Grosvenor Hotel'}$
h
(3)
$\Pi_{r.roomNo, r.type, r.price}$
$\bowtie_{b.roomNo = r.roomNo}$
$\bowtie_{h.hotelNo = b.hotelNo}$
$\sigma_{r.price > 100}$
r
b
$\sigma_{h.hotelName = 'Grosvenor Hotel'}$
h
(4)
$\Pi_{r.roomNo, r.type, r.price}$
$\bowtie_{b.hotelNo = h.hotelNo}$
$\bowtie_{r.roomNo = b.roomNo}$
$\sigma_{h.hotelName = 'Grosvenor Hotel'}$
$\sigma_{r.price > 100}$
b
r
h
(5)
$\Pi_{r.roomNo, r.type, r.price}$
$\bowtie_{b.hotelNo = h.hotelNo}$
$\bowtie_{r.roomNo = b.roomNo}$
$\Pi_{h.hotelNo}$
$\Pi_{r.roomNo, r.type, r.price}$
$\Pi_{b.roomNo, b.hotelNo}$
$\sigma_{h.hotelName = 'Grosvenor Hotel'}$
$\sigma_{r.price > 100}$
b
h
r

(b) SELECT g.guestNo, g.guestName
FROM Room r, Hotel h, Booking b, Guest g
WHERE h.hotelNo = b.hotelNo AND g.guestNo = b.guestNo AND
h.hotelNo = r.hotelNo AND h.hotelName = 'Grosvenor Hotel' AND
dateFrom >= '1-Jan-01' AND dateTo <= '31-Dec-01';

Ans:-

3b

① $\Pi_{g.guestNo,\ g.guestName}$

$\sigma_{h.hotelNo = b.hotelNo \wedge g.guestNo = b.guestNo \wedge h.hotelNO = r.hotelNO \wedge h.hotelName = 'Grosvenor\ Hotel' \wedge dateFrom >= '1-Jan-01' \wedge dateTo <= '31-Dec-01'}$

×, ×, ×

r, h, b, g

② $\Pi_{g.guestNO,\ g.guestName}$

$\sigma_{h.hotelNO = b.hotelNO}$

×

$\sigma_{h.hotelNO = r.hotelNO}$, $\sigma_{b.guestNO = g.guestNO}$

×, ×

r, $\sigma_{h.hotelName = 'Grosvenor\ Hotel'}$ (h), $\sigma_{dateFrom >= '1-Jan-01' \wedge dateTo <= '31-Dec-01'}$ (b), g

③ $\Pi_{g.guestNO,\ g.guestName}$

$\bowtie_{h.hotelNO = b.hotelNO}$

$\bowtie_{r.roomNO = h.roomNO}$, $\bowtie_{b.guestNO = g.guestNO}$

r, $\sigma_{h.hotelName = 'Grosvenor\ Hotel'}$ (h), $\sigma_{dateFrom >= '1-Jan-01' \wedge dateTo <= '31-Dec-01'}$ (b), g

④ $\Pi_{g.guestNO,\ g.guestName}$

$\bowtie_{h.hotelNO = b.hotelNO}$

$\bowtie_{r.roomNO = h.roomNO}$

$\bowtie_{b.guestNO = g.guestNO}$

$\Pi_{r.roomNO}$, $\Pi_{h.roomNO,\ h.hotelNO}$, $\Pi_{b.guestNO,\ b.hotelNO}$, $\Pi_{g.guestNO,\ g.guestName}$

r, $\sigma_{h.hotelName = 'Grosvenor\ Hotel'}$ (h), $\sigma_{dateFrom >= '1-Jan-01' \wedge dateTo <= '31-Dec-01'}$ (b), g