BSCCS2001: Practice Assignment with Solutions
Week 12

1. Consider the relation **Students** and **Activity** as shown below [Piyush:MCQ:2points]

Name	**RollNo**	**Age**	**Marks**	**Subject**
David	M003	23	78	Maths
Matthew	S007	29	54	English
Anand	C001	22	89	JAVA
Mitchel	M006	21	56	Maths
Shaun	M009	26	92	Maths
Jimmy	C009	29	42	JAVA
Richard	S003	20	99	English

Relation **Classroom**

Aid	**Sports**	**Awards**	**Points**
M003	Cricket	2	67
S007	Football	4	90
C001	Cricket	5	80
M006	Tennis	8	70
M009	Hockey	3	75

Relation **Activity**

Choose the correct output of relational algebra expression
$\Pi_{RollNo,Age,Awards}((\sigma_{Subject=`Maths`}(Classroom)) \bowtie_{RollNo=Aid} (\sigma_{Sports=`Cricket`}(Activity)))$

○

RollNo	**Age**	**Awards**
M003	23	2
S007	29	4
M006	21	8
M009	26	3

√

RollNo	**Age**	**Awards**
M003	23	2

○

RollNo	**Age**	**Awards**
M003	23	2
M006	21	8
M009	26	3

○ Invalid relational algebra query

Solution: From the equivalence rules,

$$\sigma_{\theta_1 \wedge \theta_2}(E_1 \bowtie_\theta E_2) = (\sigma_{\theta_1}(E_1)) \bowtie_\theta (\sigma_{\theta_2}(E_2))$$

The given relational algebra expression is equivalent to
$\Pi_{RollNo,Age,Awards}(\sigma_{Subject=`Maths` \wedge Sports=`Cricket`}((Classroom) \bowtie_{RollNo=Aid} (Activity)))$

Firstly, it will perform the join operation between **Classroom** and **Activity**, based on the theta condition *RollNo = Aid*.

Then, based on the select conditions, $\sigma_{Subject=`Maths`\wedge Sports=`Cricket`}$, it will filter the tuples and then by using Projection operator, it will project **RollNo**, **Age** and **Awards**.

2. Consider the following statements. [Piyush:MCQ:2points]

   1. Query Cost is generally measured as total elapsed time for answering query.
   2. Cost to write a block is less than cost to read a block.

   Choose the correct option.

   √ Statement 1 is true and Statement 2 is false

   ○ Statement 1 is false and Statement 2 is true

   ○ Both the statements are true

   ○ Both the statements are false

Solution:

- Query Cost is generally measured as total elapsed time for answering query.
- Cost to write a block is **greater** than cost to read a block.

3. Consider the following relations:
employee($\underline{EID}$, $ENAME$, $CONTACT$, $SALARY$),
project($\underline{PID}$, $PNAME$, $LOCATION$, $DURATION$),
allotment($\underline{EID, PID}$, $DATE\_OF\_ALLOTMENT$)
Consider the following equivalent join statments:
E_1**:** $employee \bowtie allotment = allotment \bowtie employee$,
E_2**:** $(employee \bowtie allotment) \bowtie project = employee \bowtie (allotment \bowtie project)$
E_3**:** $\sigma_{LOCATION="Chennai"}(project \bowtie allotment) = project \bowtie \sigma_{LOCATION="Chennai"}(allotment)$.
Segregate the equivalences hold by the Commutative property, Associative property, and Distributive property. [ARUP:MCQ:2points]

✓ E_1 by Commutative property, E_2 by Associative property, E_3 Distributive property

○ E_1 by Associative property, E_2 by Commutative property, E_3 by Distributive property

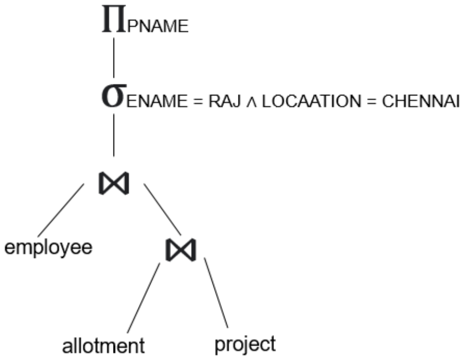
○ E_1 by Distributive property, E_2 by Commutative property, E_3 by Associative property

○ E_1 by Commutative property, E_2 by Distributive property, E_3 by Associative property

Solution:

- E_1 hold by commutative property of natural join
- E_2 hold by associative property of natural join
- E_3 hold by distributive property of select operation over the natural join operation

4. Consider the following relations:
$\textbf{employee}(\underline{EID}, ENAME, CONTACT, SALARY)$,
$\textbf{project}(\underline{PID}, PNAME, LOCATION, DURATION)$,
$\textbf{allotment}(\underline{EID, PID}, DATE\_OF\_ALLOTMENT)$
Identify the most optimized expression tree from the given options that finds out names of all the projects allotted to (ENAME) RAJ and the project location (LOCATION) is Chennai. We assume that *employee* ⋈ *allotment* is much larger than *allotment* ⋈ *project*. [ARUP:MCQ:2points]



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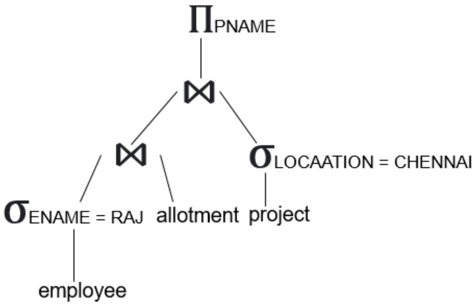

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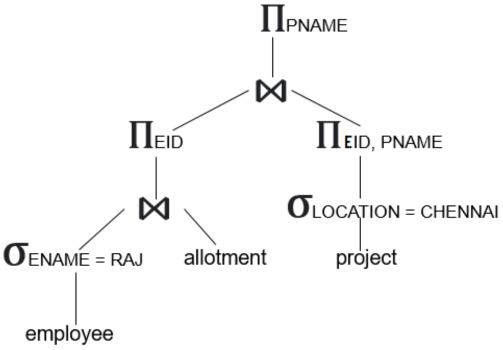

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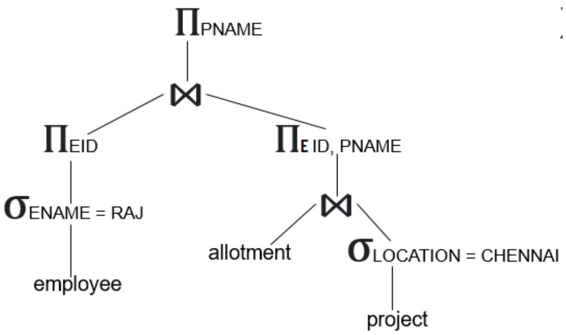

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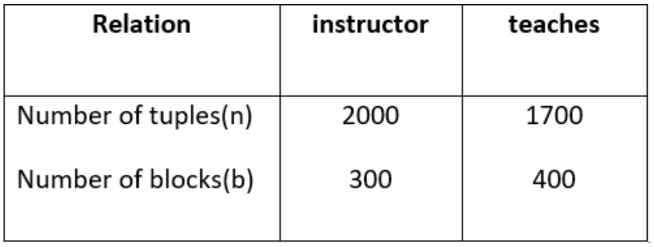
Solution:

- Option-2 is more efficient from option-1, since performing the selection as early as possible reduces the size of the relation to be joined
- Option-3 is more efficient from option-2, since performing the projection as early as possible reduces the size of the relation to be joined
- Option-4 is more efficient from option-3, since $employee \bowtie allotment$ is much larger than $allotment \bowtie project$

5. Consider a nested loop join for the given relation **instructor** and **teaches**:



Relation	instructor	teaches
Number of tuples(n)	2000	1700
Number of blocks(b)	300	400

Assuming the worst-case memory availability and considering **teaches** as outer relation, find out the estimated cost i.e., the number of blocks transfers and seeks. [Anjana: MCQ: 2 points]

○ Block Transfers= 800300, Seeks= 2300

✓ Block Transfers= 510400, Seeks= 2100

○ Block Transfers= 600400, Seeks= 2300

○ Block Transfers= 800300, Seeks= 2100

Solution: As the outer relation should be smaller, we take **teaches** as the outer relation and **instructor** as the inner relation.
Number of Block Transfers= n_t * b_i + b_t =1700 * 300 + 400 = 510400
Number of Seeks= n_t + b_t = 1700 + 400 = 2100