Relational Algebra Solutions

Q1:

$\pi_{\text{FIRST\_NAME, LAST\_NAME, SALARY}}(\text{Employee}) - _{\text{SALARY ¿}}(\pi_{\text{SALARY}}(\sigma_{\text{LAST\_NAME='Bull'}}(\text{Employee})))$

Q2:

$\pi_{\text{FIRST\_NAME, LAST\_NAME}}(\sigma_{\text{DEPARTMENT\_NAME='IT'}}(\text{Employee} \bowtie_{\text{Employee.DEPARTMENT\_ID = Departments.DEPA}}$

Q3:

$\pi_{\text{FIRST\_NAME, LAST\_NAME}}(\sigma_{\text{MANAGER\_ID}\neq\text{NULL}\wedge\text{COUNTRY\_ID='US'}}(Employee \bowtie_{\text{Employee.DEPARTMENT\_ID = D}}$

Q4:

$\pi_{\text{EMPLOYEE\_ID, FIRST\_NAME, LAST\_NAME}}(\text{Employee} - _{\text{SALARY ¿}}(\pi_{\text{AVG(SALARY)}}(\text{Employee})))$

Q5:

$\pi_{\text{FIRST\_NAME, LAST\_NAME, EMPLOYEE\_ID, JOB\_ID}}(\sigma_{\text{CITY='Toronto'}}(Employee \bowtie_{\text{Employee.DEPARTMENT\_ID = Dep}}$

Q6:

$\pi_{\text{FIRST\_NAME, LAST\_NAME, EMPLOYEE\_ID, SALARY}}(\sigma_{\text{MANAGER\_ID=}(\pi_{\text{EMPLOYEE\_ID}}(\sigma_{\text{FIRST\_NAME='Payam'}}(\text{Employee})))}$

Q7:

$$\pi_{\text{DEPARTMENT\_NAME}}(\text{Departments} \cap \text{Employee})$$

Q8:

$\text{Employee} - _{\text{DEPARTMENT\_ID NOT IN}}(\pi_{\text{DEPARTMENT\_ID}}(\sigma_{\text{MANAGER\_ID}\geq 100\wedge\text{MANAGER\_ID}\leq 200}(\text{Departments})))$

Q9:

$\pi_{\text{FIRST\_NAME, LAST\_NAME, DEPARTMENT\_ID}}(\sigma_{\text{SALARY=MIN(SALARY)}}(\text{Employee}))$

Q10:

$\pi_{\text{FIRST\_NAME, LAST\_NAME}}(\sigma_{\text{EMPLOYEE\_ID}\in(\pi_{\text{MANAGER\_ID}}(\text{Departments}))}(\text{Employee}))$

Q11:

$\pi_{\text{EMPLOYEE\_ID, FIRST\_NAME, LAST\_NAME, JOB\_ID}}(\sigma_{\text{SALARY}<(\pi_{\text{SALARY}}(\sigma_{\text{JOB\_ID='MK\_MAN'}}(\text{Employee})))}(\text{Employee}))$

Q12:

$$\pi_{\text{FIRST\_NAME, LAST\_NAME, SALARY}}(\sigma_{\text{SALARY}>\text{AVG(SALARY)}}(\text{Employee}))$$

Q13:

$$\pi_{\text{FIRST\_NAME, LAST\_NAME, SALARY}}(\sigma_{\text{SALARY}=(\pi_{\text{MIN\_SALARY}}(\sigma_{\text{Employee.JOB\_ID = Jobs.JOB\_ID}}(\text{Employee})\times\text{Jobs}))}(\text{Employ}$$

Q14:

$$\pi_{\text{FIRST\_NAME, LAST\_NAME, SALARY}}(\sigma_{\text{SALARY}>\text{AVG(SALARY)}}(\mathit{Employee} \bowtie_{\text{Employee.DEPARTMENT\_ID = Departmer}}$$

Q15:

$$\pi_{\text{FIRST\_NAME, LAST\_NAME, SALARY}}(\sigma_{\text{SALARY}>(\pi_{\text{SALARY}}(\sigma_{\text{LAST\_NAME='Bell'}}(\text{Employee})))}(\text{Employee}))$$

Q16:

$$\pi_{\text{FIRST\_NAME, LAST\_NAME, SALARY}}(\sigma_{\text{SALARY}=\text{MIN(SALARY)}}(\text{Employee}))$$

Q17:

$$\pi_{\text{FIRST\_NAME, LAST\_NAME, SALARY}}(\sigma_{\text{SALARY}>\text{AVG(SALARY)}}(\text{Employee}))$$

Q18:

OFFSET 2(Employee) LIMIT 1