ASSIGNMENT 3

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1. Retrieve the names of all employees in department 5 who work more than 10 hours per week on Product x project.

Ans:- $PROD \leftarrow \sigma_{PNAME = 'Productx'} (PROJECT)$

$EMP\_PROJ \leftarrow PROD \bowtie_{PROD.PNO = WORKS\_ON.PNO \ AND \ HOURS > 10} WORKS\_ON$

$EMP\_PROJ\_DEP \leftarrow \sigma_{DNO = 5} (EMPLOYEE \bowtie_{EMPLOYEE.SSN = EMP\_PROJ.SSN} EMP\_PROJ)$

$RES \leftarrow \pi_{FNAME, MINIT, LNAME} (EMP\_PROJ\_DEP)$

2. List the names of all employees in departmen who have a dependent with the same first name as themselves.

Ans:- $EMP\_DEP \leftarrow EMPLOYEE \bowtie_{SSN = ESSN \ AND \ FNAME = DEPNAME} DEPENDENT$

$RES \leftarrow \pi_{FNAME, MINIT, LNAME} (EMP\_DEP)$

3. Find names of all employees who are directly supervised by 'Franklin Wong'

Ans:- $SUP \leftarrow \sigma_{FNAME = 'Franklin' \ AND \ LNAME = 'Wong'} (EMPLOYEE)$

$SUP\_SSN \leftarrow \pi_{SSN} (SUP)$

$RES \leftarrow \pi_{FNAME, LNAME} (EMPLOYEE \bowtie_{SSN = SUPERSSN} SUP\_SSN)$

4. For each project, list the project name and total hours per week (by all employees) spent on that project

Ans: $TOT\_HOURS(PNO,T\_H) \leftarrow {}_{PNO}\mathcal{F}_{SUM\ HOURS}\ (WORKS\_ON)$

$HOURS\_PROJ \leftarrow TOT\_HOURS \bowtie_{TOT.HOURS.PNO = PROJECT.PNO} PROJECT$

$RESULT \leftarrow \pi_{PNAME,\ T\_H}\ (HOURS\_PROJ)$

5. Retrieve names of all employees who work on every project (use division)

Ans: $PROJ\_NOS \leftarrow \pi_{PNO}\ (PROJECT)$

$PROJ\_EMP \leftarrow \pi_{PNO,\ SSN}\ (EMPLOYEE)$

$RES1 \leftarrow PROJ\_EMP \div PROJ\_NOS$

$FINAL \leftarrow \pi_{FNAME, LNAME, MINIT}\ (RES1 * EMPLOYEE)$

6. Retrieve names of all employees who do not work on any project

Ans: $TOT\_EMP \leftarrow \pi_{SSN}\ (EMPLOYEE)$

$WORKING\_PROJ \leftarrow \pi_{SSN}\ \cancel{(PROJECT)}\ (WORKS\_ON)$

NOT_WORKING ← TOT_EMP − WORKING_PROJ

FINAL_NAMES ← π(NOT_WORKING * EMPLOYEE)
$_{FNAME, LNAME, MINIT}$

7. For each department, retrieve department name and average salary of all employees working in that department

Ans: SAL (DNO, AV_SAL) ← $\mathcal{F}$ EMPLOYEE
$_{DNO}$ $_{avg\ SALARY}$

RES1 ← SAL * DEPARTMENT

FINAL_RESULT ← π (RES1)
$_{DNAME, AV\_SAL}$

8. Retrieve average salary of all female employees

Ans:- FEMALE_EMP ← $\sigma_{GENDER='F'}$ (EMPLOYEE)

AVG_FEMALE ← $\mathcal{F}_{AVG\ SALARY}$ (FEMALE_EMP)

9. Find the names and addresses of all employees who work on atleast one project located in Houston but whose department has no location in Houston

Ans:- LOC_PROJ ← $\sigma_{PLOCATION='Houston'}$ (PROJECT)

$$HOUS \leftarrow \pi_{SSN} (WORKS\_ON \bowtie_{WORKS\_ON.PNO = LOC\_PROJ.PNO} LOC\_PROJ)$$

$$HOUS\_EMP \leftarrow \pi_{SSN} (HOUS \bowtie_{HOUS.SSN = EMPLOYEE.SSN} EMPLOYEE)$$

$$R1 \leftarrow \pi_{FNAME, MINIT, LNAME, ADDRESS} (HOUS\_EMP)$$

$$DEPT\_HOUS \leftarrow \sigma_{DLOCATION = 'Houston'} (DEPT\_LOCATIONS \bowtie_{DEPT\_LOCATIONS.DNO = EMPLOYEE.DNO} EMPLOYEE)$$

$$R2 \leftarrow \pi_{FNAME, MINIT, LNAME, ADDRESS} (DEPT\_HOUS)$$

$$FINAL \leftarrow R1 - R2$$

10. List the last names of all department managers who have no dependents

Ans:-

$$MNGS(SSN) \leftarrow \pi_{MGRSSN} (DEPARTMENT)$$

$$MGR\_DEPEN \leftarrow \pi_{SSN} (DEPENDENT)$$

$$NO\_DEPEN \leftarrow MNGS(SSN) - MGR\_DEPEN$$

$$RESULT \leftarrow \pi_{LNAME} (NO\_DEPEN * EMPLOYEE)$$

LIBRARY DATABASE SCHEMA

11. Find all books (book titles) that are borrowed from 'Richardson' library branch.

Ans:

$$LIB\_BR \leftarrow \sigma_{Branch\_name = 'Richardson'} (LIBRARY\_BRANCH)$$

$$R1 \leftarrow LIB\_BR \bowtie_{LIB\text{-}BR.Branch\_id = BOOK\_COPIES.Branch\_id} BOOK\_COPIES$$

$$RESULT \leftarrow \pi_{title} (R1 \bowtie_{R1.Book\_id = Book.Book\_id} BOOK)$$

12. Find all books (book titles) that are overdue.

Ans:

$$D\_D \leftarrow \sigma_{\substack{SYSDATE > DUEDATE \\ AND\ Return\_date = 'Null'}} (BOOK\_LOANS)$$

$$R1 \leftarrow D\_D \bowtie_{D.D.Book\ id = R1.Book\_id} R1$$

$$FINAL \leftarrow \pi_{title} (R1)$$

13. For each library branch find total number of books that are overdue.

Ans:

$$R1 \leftarrow {}_{Branch\ id}\mathcal{F}_{COUNT\ Book\text{-}id} \left(\sigma_{\substack{SYSDATE > DUEDATE \\ AND\ Return\text{-}date = 'NULL'}} (BOOK\_LOANS) \right)$$

$$R2 \leftarrow \int R1 \bowtie_{\substack{R1.Branch\text{-}id = \\ LIBRARY\_BRANCH.Branch\ id}} LIBRARY\_BRANCH$$

$$FINAL \leftarrow \pi_{Branch\_Name,\ COUNT\_Book\ id} (R2)$$

14. Retrieve the names of all borrowers who have overdue books.

Ans :- $OVERDUE \leftarrow \pi_{CARD\_NO} (\sigma_{\substack{SYSDATE > DUEDATE \\ AND\ Return\_date = 'NULL'}} (BOOK\_LOANS))$

$R1 \leftarrow OVERDUE \bowtie_{OVERDUE.CARD\_NO = BORROWER.Card\_No} BORROWER$

$FINAL \leftarrow \bowtie \pi_{Name} (R1)$

15. Retrieve the names of all borrowers who do not have any books checked out

Ans :- $TOT\_BOR \leftarrow \pi_{Card\_No} (BORROWER)$

$BOOK\_CHECKED \leftarrow \pi_{Card\_No} (BORROWER \bowtie_{\substack{BORROWER.card\_No = \\ BOOK\_LOANS.Card\_No}} BOOK\_LOANS)$

$R1 \leftarrow TOT\_BOR - BOOK\_CHECKED$

$FINAL \leftarrow \pi_{Name} (R1 * BORROWER)$

16. For each book that is checked out from "Richardson" library branch and whose Due-Date is today. retrieve book title, borrowers name and borrower's address.

Ans:-

$R1 \leftarrow \sigma_{\substack{Branch\_name = 'Richardson' \\ AND\ SYSDATE = DUEDATE}} (LIBRARY\_BRANCH * BOOK\_LOANS)$

$$R2 \leftarrow \pi_{Book\_id, Card\_No} (R1)$$

$$R3 \leftarrow \pi_{Name, Bookid, Address} (R_2 * BORROWER)$$

$$FINAL \leftarrow \pi_{Title, Name, Address} (R3 * BOOK)$$

17. for each library branch, retrieve branch name and total number of books loaned out from that branch.

Ans :

$$R1 \leftarrow {}_{Branch\text{-}id} \mathcal{F}_{COUNT \ Book\text{-}id} (BOOK\_LOANS)$$

$$R2 \leftarrow R1 * LIBRARY\_BRANCH$$

$$FINAL \leftarrow \pi_{Branch\text{-}name, \ Count\_Book\text{-}id} (R2)$$

18. Retrieve names, addresses and number of books checked out for all borrowers who have more than 5 books checked out.

Ans:

$$R1 \leftarrow {}_{Card\text{-}No} \mathcal{F}_{COUNT \ Book\text{-}id} \left(\sigma_{Returndate = null} (BOOK\_LOANS) \right)$$

$$R2 \leftarrow \sigma_{COUNT \ Book\text{-}id > 5} (R1 * BORROWER)$$

$$FINAL \leftarrow \pi_{Name, Address, COUNT\_Book\text{-}id} (R2)$$