CS 6360.002 – DATABASE DESIGN RSN170330

ASSIGNMENT #03

1. $R1(SSN) \leftarrow \pi_{SSN}(\sigma_{DNO=5}(EMPLOYEE))$

   $R2 \leftarrow \sigma_{PNAME=PROJECTX}(PROJECT \bowtie_{PNO=PNO} WORKS\_ON)$

   $R3(SSN) \leftarrow \pi_{ESSN}(\sigma_{HOURS>10}(R2))$

   $Result \leftarrow \pi_{FNAME,LNAME}(EMPLOYEE * (R1 * R3))$

2. $R1(SSN, FNAME) \leftarrow \pi_{SSN,FNAME}(EMPLOYEE)$

   $R2(SSN, FNAME) \leftarrow \pi_{ESSN,DEP\_NAME}(DEPENDENT)$

   $R3 \leftarrow \pi_{SSN}(R1 * R2)$

   $Result. \leftarrow \pi_{FNAME,LNAME}(EMPLOYEE * R3)$

   NOTE : As R1 and R2 has same attributes (both Names and domain as well), on * condition these both attributes would be compared. ☺

   Assumption : DEP_Name contains only First Names of the Dependents.

3. $R1(SSN) \leftarrow \pi_{SSN}(\sigma_{FNAME='FRANKLIN' \text{ AND } LNAME='WONG'}(EMPLOYEE))$

   $Result \leftarrow \pi_{FNAME,LNAME}(EMPLOYEE \bowtie_{SUPERSSN=SSN} R1)$

4. $R1(PNO, TH) \leftarrow {}_{PNO}\mathcal{F}_{SUM(HOURS)}(WORKS\_ON)$

$Result \leftarrow \pi_{PNAME, TH}(PROJECT \bowtie_{PNO = PNO} R1)$

5. $R1 \leftarrow \pi_{PNO}(PROJECT)$

$R2 \leftarrow \pi_{ESSN, PNO}(WORKS\_ON)$

$R3(SSN) \leftarrow R2 \div R1$

$Result \leftarrow \pi_{FNAME, LNAME}(R3 * EMPLOYEE)$

6. $R1 \leftarrow \pi_{SSN}(EMPLOYEE)$

$R2(SSN) \leftarrow \pi_{ESSN}(WORKS\_ON)$

$R3 \leftarrow R1 - R2$

$Result \leftarrow \pi_{FNAME, LNAME}(R3 * EMPLOYEE)$

7. $R1(DNO, AVGS) \leftarrow {}_{DNO}\mathcal{F}_{AVERAGE(SALARY)}(EMPLOYEE)$

$Result \leftarrow \pi_{DNAME, AVGS}(DEPARTMENT \bowtie_{DNO = DNO} R1)$

8. $Result \leftarrow \mathcal{F}_{AVERAGE(SALARY)}(\sigma_{GENDER='F'}(EMPLOYEE$

9. $R1 \leftarrow (DEPT\_LOCATIONS - (\sigma_{DLOCATION = 'HOUSTON'}(DEPT\_LOCATIONS)))$

$R2 \leftarrow \sigma_{PLOCATION = 'HOUSTON'}(R1 \bowtie_{DNO = DNO} PROJECT)$

$R3(SSN) \leftarrow \pi_{ESSN}(R2 \bowtie_{PNO = PNO} WORKS\_ON)$

$Result \leftarrow \pi_{FNAME, LNAME, ADDRESS}(R3 * EMPLOYEE)$

10. $R1(SSN) \leftarrow \Pi_{MGRSSN}(DEPARTMENT)$

$R2(SSN) \leftarrow \Pi_{ESSN}(DEPENDENT)$

$R3 \leftarrow R1 - R2$

$Result \leftarrow \Pi_{FNAME, LNAME}(R3 * EMPLOYEE)$

11. USING LIBRARY DATABASE

$R1 \leftarrow \sigma_{BRANCH\_NAME = 'RICHARDSON'}(LIBRARY\_BRANCH)$

$R2 \leftarrow BOOK\_LOANS \bowtie_{BRANCH\_ID = BRANCH\_ID} R1$

$R3 \leftarrow \Pi_{TITLE}(BOOK \bowtie_{BOOK\_ID} R2)$

12. $R1 \leftarrow \sigma_{(DUE\_DATE < CURRENT\_DATE \text{ AND } RETURN\_DATE = NULL)}(BOOK\_LOANS)$

$Result \leftarrow \Pi_{TITLE}(R1 \bowtie_{BOOK\_ID} BOOK)$

13. $R1 \leftarrow \sigma_{(DUE\_DATE < CURRENT\_DATE \text{ AND } RETURN\_DATE = NULL)}(BOOK\_LOANS)$

$R2(BRANCH\_ID, NUM\_BOOKS) \leftarrow {}_{BRANCH\_ID}\mathcal{F}_{COUNT(BOOK\_ID)}(R1)$

$Result \leftarrow \Pi_{BRANCH\_NAME, NUM\_BOOKS}(LIBRARY\_BRANCH \bowtie_{BRANCH\_ID} R2)$

14. $R1 \leftarrow \Pi_{CARD\_NO}(\sigma_{(DUE\_DATE < CURRENT\_DATE \text{ AND } RETURN\_DATE = NULL)}(BOOK\_LOANS))$

$Result \leftarrow \Pi_{NAME}(R1 * BORROWER)$

15. $R1(CARD\_NO) \leftarrow \Pi_{CARD\_NO}(BOOK\_LOANS)$

$R2(CARD\_NO) \leftarrow \Pi_{CARD\_NO}(BORROWER)$

$R3 \leftarrow R2 - R1$

$Result \leftarrow \Pi_{NAME}(R3 * BORROWER)$

16. $R1 \leftarrow \Pi_{BRANCH\_ID}\left(\sigma_{BRANCH\_NAME = 'RICHARDSON'}(LIBRARY\_BRANCH)\right)$

$R2 \leftarrow \Pi_{BOOK\_ID,\ CARD\_NO}\left(\sigma_{DUE\_DATE = CURRENT\_DATE}(BOOK\_LOANS * R1)\right)$

$Result \leftarrow \Pi_{TITLE,\ NAME,\ ADDRESS}(BOROWER * (BOOK * R2))$

17. $R1(BRANCH\_ID, NUM\_BOOKS) \leftarrow {}_{BRANCH\_ID}\mathcal{F}_{COUNT(BOOK\_ID)}(BOOK\_LOANS)$

$Result \leftarrow \Pi_{BRANCH\_NAME,\ NUM\_BOOKS}(LIBRARY\_BRANCH * R1)$

18. $R1(CARD\_NO, NUM\_BOOKS) \leftarrow {}_{CARD\_NO}\mathcal{F}_{COUNT(BOOK\_ID)}(BOOK\_LOANS)$

$Result \leftarrow \Pi_{NAME,\ ADDRESS,\ NUM\_BOOKS}\left(\sigma_{NUM\_BOOKS > 5}(BORROWER * R1)\right)$

ASSUMPTIONS: * each BOOK-ID corresponds to a unique BOOK.
* Presence of a Card-No in BOOK-LOANS corresponds to a BOOK checked out / loaned out of a branch.