CS34800 - PSO Exercise – Week 5

Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course:

STUDENT (ID, Name, Major, Bdate)
COURSE (Course_number, Cname, Dept)
ENROLLED (ID, Course_number, Quarter, Grade)
BOOK_ADOPTION (Course_number, Quarter, Book_isbn)
TEXT (Book_isbn, Book_title, Publisher, Author)

Write the following queries in relational algebra:

1. List the names for courses, which have used textbooks published by 'Pearson Publishing' or 'Springer Publishing'.

PP_OR_SP ← $\pi_{\text{Book\_isb}}$ ($\sigma_{\text{Publisher='Pearson Publishing' or 'Springer Publishing'}}$ (TEXT))
PP_SP_ADOPTIONS ← BOOK_ADOPTION ⋈ PP_OR_SP
PP_SP_COURSES ← $\pi_{\text{Course\_number}}$(PP_SP_ADOPTIONS)
RESULT ← π_{Cname} (PP_SP_COURSES ⋈ COURSE)

2. List the names for courses, which have used textbooks published by 'Pearson Publishing' and 'Springer Publishing'.

SP_TEXTS ← $\pi_{\text{Book\_isb}}$ ($\sigma_{\text{Publisher='Springer Publishing'}}$ (TEXT))
PP_TEXTS ← $\pi_{\text{Book\_isb}}$ ($\sigma_{\text{Publisher='Pearson Publishing'}}$ (TEXT))
SP_COURSES ← $\pi_{\text{Course\_number}}$ (BOOK_ADOPTION ⋈ SP_TEXTS)
PP_COURSES ← $\pi_{\text{Course\_number}}$ (BOOK_ADOPTION ⋈ SP_TEXTS)
PP_AND_SP_COURSES ←PP_COURSES ∩ SP_COURSES
RESULT ← π_{Cname} (PP_AND_SP_COURSES⋈ COURSE)

3. List the departments, which have all of their adopted books published by 'Pearson Publishing'.

PP_BOOKS ← $\pi_{\text{Book\_isb}}(\sigma_{\text{Publisher='Pearson Publishing'}}(\text{TEXT}))$

NON_PP_BOOKS ← $\pi_{\text{Book\_isb}}(\sigma_{\text{Publisher'} \neq \text{Pearson Publishing'}}(\text{TEXT}))$

PP_COURSES ← BOOK_ADOPTION ⋈ PP_BOOKS

NON_PP_COURSES ← BOOK_ADOPTION ⋈ NON_PP_BOOKS

PP_DEPT ← π_{Dept} (PP_COURSES⋈ COURSE)

NON_PP_DEPTS ← π_{Dept} (NON_PP_COURSES⋈ COURSE)

RESULT ← PP_DEPT - NON_PP_DEPTS

4. Provide a list of textbooks (include Course_number, Book_isbn, Book_title) for courses offered by the 'CS' department that have used more than one book.

CS_COURSES ← $\pi_{\text{Course\_number}}(\sigma_{\text{Dept='CS'}}(\text{Course}))$

CS_BOOK_ADOPTIONS ← CS_COURSES ⋈BOOK_ADOPTIONS

CS_BA_2(Course_number2,Book_isb2) ← $\pi_{\text{Course\_number, Book\_isbn}}$ (CS_BOOK_ADOPTIONS)

DIFF_BOOKS ← CS_BOOK_ADOPTIONS ⋈ CS_BA_2

Course_number = Course_number2 and Book_isbn = Book_isbn2

RES_BOOKS ← TEXT ⋈ DIFF_BOOKS

RESULT ← $\pi_{\text{Course\_number, Book\_isbn, Book\_title}}$ (RES_BOOKS)

5. List the names of students who have not been enrolled in any courses that use textbooks published by 'Springer Publishing'.

SPRINGER_BOOKS ← $\pi_{\text{Book\_isbn}}$ ($\sigma_{\text{Publisher='Springer Publishing'}}$ (TEXT))

SPR_ENR ← (ENROLLED ⋈ BOOK_ADOPTIONS) ⋈ SPRINGER_BOOKS

SPR_ENR_IDS ← π_{ID} (SPR-ENR)

NO_SPR_IDS ← (π_{ID} (STUDENT)) - SPR_ENR_IDS

RESULT ← π_{Name} (NO_SPR_IDS ⋈ STUDENT)

6. List the names of students who are enrolled in all courses offered by the 'Math' department in the quarter 'Fall 2014', which use a textbook published by 'McGraw-Hill'.

MATHCRS ← $\pi_{\text{Course\_number}}$ ($\sigma_{\text{Dept='MATH'}}$ (Course))

F14ADOPTIONS ← $\sigma_{\text{Quarter=''F14'}}$ (MATHCRS ⋈ BOOK_ADOPTIONS)

F14TEXTS ← F14ADOPTIONS ⋈ TEXT

MCGRAWTEXTS ← $\sigma_{\text{Publisher='MCGraw Hill'}}$ (F14TEXTS)

MCGRAWCRS ← $\pi_{\text{Course\_number, Quarter}}$ (MCGRAWTEXTS)

STU_ENRS ← $\pi_{\text{ID, Course\_number, Quarter}}$ (Enrolled)

STU_IDS ← STUDENTS ÷ MCGRAWCRS

RESULT ← STUDENT ⋈ STU_IDS