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CptS 451

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HW 3

For each query, include the relational algebra expression, expression tree and output

1. Find the students in ‘EE’ major who failed a class

a. Return the major, firstname, lastname, ID, email, ID of the failed class and the grade earned

Relational algebra expression:

π Student.major, UserTable.firstName, UserTable.lastName, Student.studentID, UserTable.email, Enroll.classID, Enroll.grade (σ (Student.studentID = Enroll.studentID) ∧ (Student.major = 'EE') ∧ (Enroll.grade < 2) ((UserTable ⨝ UserTable.userID = Student.studentID Student) ⨯ Enroll))

Relational algebra tree:

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Description automatically generated

Output:

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b. Return the firstname, lastname, ID, email of the student, major and courseNum of the class failed and the grade earned

Relational algebra expression:

π UserTable.firstName, UserTable.lastName, Student.studentID, UserTable.email, Class.major, Class.courseNum, Enroll.grade (σ (Student.studentID = Enroll.studentID) ∧ (Student.major = 'EE') ∧ (Enroll.grade < 2) ((UserTable ⨝ UserTable.userID = Student.studentID Student) ⨯ (Class ⨝ Class.classID = Enroll.classID Enroll)))

Relational algebra tree:

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Output:

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c. Find all students who failed a class offered by their own majors. Return major, firstname, lastname, ID, email, courseNum, and grade earned

Relational algebra expression:

π Student.major, UserTable.firstName, UserTable.lastName, Student.studentID, UserTable.email, Class.courseNum, Enroll.grade (σ (Student.studentID = Enroll.studentID) ∧ (Student.major = Class.major) ∧ (Enroll.grade < 2) ((UserTable ⨝ UserTable.userID = Student.studentID Student) ⨯ (Class ⨝ Class.classID = Enroll.classID Enroll)))

Relational algebra tree:

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Output:

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2. Find the courses that have two or more prerequisite courses

Relational algebra expression:

γ Prerequisite.major, Prerequisite.courseNum; count(Prerequisite.prereqCourseNum) -> prereqCount (Prerequisite ⨝ (Prerequisite.prereqCourseNum ≠ B.prereqCourseNum ∧ Prerequisite.courseNum = B.courseNum) (ρ B (Prerequisite)))

Relational algebra tree:

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Output:

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