Questions

Q1. Consider a data base with the following schema

Students(ssn, name, address)
Course(code,title)
Registered(ssn,code)

1. List the codes of courses for which no student is registered
2. The titles of courses for which no student is registered.
3. Names of the students and the titles of the courses they registered to
4. SSNs of students who are registered for 'Database Systems' or 'Analysis of Algorithms'.
5. SSNs of students who are registered for both 'Database Systems' and 'Analysis of Algorithms'.
6. List of courses in which all students are registered.

Answers

1. π code (Course) - π code (Registered)
2. πname ((πcode (Course) - πcode (Registered)) $\bowtie$ Course)
3. πname,title (Student $\bowtie$ Registered $\bowtie$ Course)
4. πssn (Student $\bowtie$ Registered $\bowtie$ (σ title='Database Systems' Course)) $\cup$ πssn (Student $\bowtie$ Registered $\bowtie$ (σ title='Analysis of Algorithms' Course))
5. πssn (Student $\bowtie$ Registered $\bowtie$ (σ title='Database Systems' Course)) $\cap$ πssn (Student $\bowtie$ Registered $\bowtie$ (σ title='Analysis of Algorithms' Course))
6. πcode, ssn (Registered) / πssn (Student)

Give the following queries in the relational algebra using the relational schema
student(id, name)
enrolledIn(id, code)
subject(code, lecturer)

1. What are the names of students enrolled in cs3020?
2. Which subjects is Hector taking?
3. Who teaches cs1500?
4. Who teaches cs1500 or cs3020?
5. Who teaches at least two different subjects?
6. What are the names of students in cs1500 or cs3010?
7. What are the names of students in both cs1500 and cs1200?

8. What are the names of students in at least two different subjects?
9. What are the codes of all the subjects taught?
10. What are the names of all the students?
11. What are the names of all the students in cs1500?
12. What are the names of students taking a subject taught by Roger.
13. What are the names of students who are taking a subject not taught by Roger?

Answers

1. π name(σ cs3020=code(student $\bowtie$ enrolledIn))
2. π code(σ name=Hector(student $\bowtie$ enrolledIn))
3. π lecturer(σ code=cs1500(subject))
4. π lecturer(σ code=cs1500 $\vee$ code=cs3020(subject))
5. Solution: For this query we have to relate subject to itself. To disambiguate the relation, we will call the subject relation R or S.

   lecturer(σ R.lecturer = S.lecturer AND R.code < > S.code(R $\bowtie$ S))
6. π name(σ code=cs1500(student $\bowtie$ enrolledIn)) $\cup$ π name(σ code=cs3010(student $\bowtie$ enrolledIn))
7. π name(σ code=cs1500(student $\bowtie$ enrolledIn)) $\cap$ π name(σ code=cs3010(student $\bowtie$ enrolledIn))
8. For this query we have to relate *enrolledIn* to itself. To disambiguate the relation, we will call the enrolledIn relation R or S.

   π name(student $\bowtie$ (σ R.id = S.id AND R.code < > S.code(R $\bowtie$ S)))
9. π code(subject)
10. π name(student)
11. π name(σ code=cs1500(student $\bowtie$ enrolledIn))
12. π name(σ lecturer=Roger(student $\bowtie$ enrolledIn $\bowtie$ subject))
13. π name(σ ecturer < > Roger(student $\bowtie$ enrolledIn $\bowtie$ subject))