

Филиппов Дмитрий, М3439

Домашнее задание 6.

Схема БД: Courses(CId, GId, CName), Lecturers(LId, LName), Marks(SId, CId, GId, Mark), Groups(GId, GName), Students(SId, GId, SName), Plan(LId, CId, GId).

Переменные: S :: Students, G :: Groups, L :: Lecturers, M : Marks, C : Courses, P :: Plan.

Запросы:

1. Информация о студентах с заданной оценкой по предмету «Базы данных»

- Кorteжи: `select S.SId, S.GId, S.SName from S where $\exists C(\exists M(C.CName = \text{'Базы данных'} \wedge S.GId = G.GId \wedge M.SId = S.SId \wedge M.CId = C.CId \wedge M.Mark = fixMark))$`
- Datalog: $StudentWithDBMark(SId, GId, SName) : \neg Student(SId, GId, SName)$
 $StudentWithDBMark(SId, GId, SName) : \neg Course(CId, GId, CName)$
 $StudentWithDBMark(SId, GId, SName) : \neg Mark(SId, CId, _, Mark)$
 $StudentWithDBMark(SId, GId, SName) : \neg CName = \text{'Базы данных'}, Mark = fixMark$
- SQL: `select (S.SId, S.GId, S.SName) from S where exists (select * from C where exists (select * from M where C.CName = 'Базы данных' and S.GId = G.GId and M.SId = S.SId and M.CId = C.CId and M.Mark = fixMark));`

2. Информация о студентах, не имеющих оценки по предмету «Базы данных»

• Среди всех студентов:

- Кorteжи: `select S.SId, S.GId, S.SName from S where $\forall C(\forall M(C.CName \neq \text{'Базы данных'} \vee S.GId \neq G.GId \vee M.SId \neq S.SId \vee M.CId \neq C.CId \vee M.Mark \neq fixMark))$`
- Datalog: $StudentWithoutDBMark(SId, GId, SName) : \neg Student(SId, GId, SName)$
 $StudentWithoutDBMark(SId, GId, SName) : \neg Course(CId, GId, CName)$
 $StudentWithoutDBMark(SId, GId, SName) : \neg notMark(SId, CId, _, Mark)$
 $StudentWithoutDBMark(SId, GId, SName) : \neg CName = \text{'Базы данных'}$
- SQL: `select (S.SId, S.GId, S.SName) from S where not exists (select * from C where exists (select * from M where C.CName = 'Базы данных' and S.GId = G.GId and M.SId = S.SId and M.CId = C.CId and M.Mark = fixMark));`

• Среди всех студентов, у которых есть предмет:

- Кorteжи: `select S.SId, S.GId, S.SName from S where $\forall C(\forall M(C.CName \neq \text{'Базы данных'} \vee S.GId \neq G.GId \vee M.SId \neq S.SId \vee M.CId \neq C.CId \vee M.Mark \neq fixMark)) \wedge \exists C(\exists P(C.CName = \text{'Базы данных'} \wedge S.GId = P.GId \wedge P.CId = C.CId))$`
- Datalog: $StudentWithoutDBMark(SId, GId, SName) : \neg Student(SId, GId, SName)$
 $StudentWithoutDBMark(SId, GId, SName) : \neg Course(CId, GId, CName)$
 $StudentWithoutDBMark(SId, GId, SName) : \neg notMark(SId, CId, _, Mark)$
 $StudentWithoutDBMark(SId, GId, SName) : \neg Plan(_, CId, GId)$
 $StudentWithoutDBMark(SId, GId, SName) : \neg CName = \text{'Базы данных'}$
- SQL: `select (S.SId, S.GId, S.SName) from S where not exists (select * from C where exists (select * from M where C.CName = 'Базы данных' and S.GId = G.GId and M.SId = S.SId and M.CId = C.CId and M.Mark = fixMark)) and exists (select * from C where exists (select * from P where C.CName = 'Базы данных' and S.GId = P.GId and P.CId = C.CId));`

3. Информацию о студентах, имеющих хотя бы одну оценку у заданного лектора

- Кортежи: $\text{select } S.SId, S.GId, S.SName \text{ from } S \text{ where } \exists L(\exists M(\exists P(L.LName = fixLecturerName \wedge S.GId = G.GId \wedge M.SId = S.SId \wedge P.SId = S.SId \wedge P.LId = L.LId \wedge P.CId = M.CId \wedge P.GId = M.GId)))$
- Datalog: $StudentWithAtLeastOneMark(SId, GId, SName) : \neg Student(SId, GId, SName)$
 $StudentWithAtLeastOneMark(SId, GId, SName) : \neg Lecturers(LId, LName)$
 $StudentWithAtLeastOneMark(SId, GId, SName) : \neg Mark(SId, _, GId, _)$
 $StudentWithAtLeastOneMark(SId, GId, SName) : \neg Plan(LId, CId, GId)$
 $StudentWithAtLeastOneMark(SId, GId, SName) : \neg LName = fixLecturerName$
- SQL: $\text{select } (S.SId, S.GId, S.SName) \text{ from } S \text{ where exists (select * from } L \text{ where exists (select * from } M \text{ where exists (select * from } P \text{ where (L.LName = fixLecturerName and S.GId = G.GId and M.SId = S.SId and P.SId = S.SId and P.LId = L.LId and P.CId = M.CId and P.GId = M.GId)))));$

4. Идентификаторы студентов, не имеющих ни одной оценки у заданного лектора

- Кортежи: $\text{select } S.SId, S.GId, S.SName \text{ from } S \text{ where } \forall L(\forall M(\forall P(L.LName \neq fixLecturerName \vee S.GId \neq G.GId \vee M.SId \neq S.SId \vee P.SId \neq S.SId \vee P.LId \neq L.LId \vee P.CId \neq M.CId \vee P.GId \neq M.GId)))$
- Datalog: $StudentsWithNoMarks(SId, GId, SName) : \neg Student(SId, GId, SName)$
 $StudentsWithNoMarks(SId, GId, SName) : \neg Lecturers(LId, LName)$
 $StudentsWithNoMarks(SId, GId, SName) : \neg notMark(SId, _, GId, _)$
 $StudentsWithNoMarks(SId, GId, SName) : \neg Plan(LId, CId, GId)$
 $StudentsWithNoMarks(SId, GId, SName) : \neg LName = fixLecturerName$
- SQL: $\text{select } (S.SId, S.GId, S.SName) \text{ from } S \text{ where not exists (select * from } L \text{ where exists (select * from } M \text{ where exists (select * from } P \text{ where (L.LName = fixLecturerName and S.GId = G.GId and M.SId = S.SId and P.SId = S.SId and P.LId = L.LId and P.CId = M.CId and P.GId = M.GId)))));$

5. Всех студентов, имеющих оценки по всем предметам заданного лектора

- Кортежи: $\text{select } S.SId, S.GId, S.SName \text{ from } S \text{ where } \exists LCourses(\exists M(M.SId = S.SId \wedge M.CId = LCourses.CId)) \quad LCourses :: \text{select } C.CId, C.CName \text{ where } \exists L(\exists C(\exists P(L.LName = fixLecturerName \wedge P.LId = L.LId \wedge P.CId = C.CId)))$
- Datalog: $LCourses(CId, CName) : \neg Lecturer(LId, LName)$
 $LCourses(CId, CName) : \neg Course(CId, _, _)$
 $LCourses(CId, CName) : \neg Plan(LId, CId, _)$
 $LCourses(CId, CName) : \neg LName = fixLecturerName$
 $StudentsWithAllMarks(SId, GId, SName) : \neg Student(SId, GId, SName)$
 $StudentsWithAllMarks(SId, GId, SName) : \neg LCourses(CId, _)$
 $StudentsWithAllMarks(SId, GId, SName) : \neg Mark(SId, CId, _, _)$
- SQL: $\text{select } (S.SId, S.GId, S.SName) \text{ from } S \text{ where exists (select * from } L \text{ where exists (select * from } C \text{ where exists (select * from } P \text{ where exists (select * from } M \text{ where L.LName = fixLecturerName and P.LId = L.LId and P.CId = C.CId and M.SId = S.SId and M.CId = C.CId)))));$

6. Для каждого студента имя и курсы, которые он должен посещать

- Кортежи: `select S.SName, C.CId, C.CName from S, C where $\exists P(P.CId = C.CId \wedge P.GId = S.GId)$`
- Datalog: $StudentsAndCoursesToVisit(SId, GId, SName) : \neg Student(_, GId, SName)$
 $StudentsAndCoursesToVisit(SId, GId, SName) : \neg Plan(_, Id, GId)$
 $StudentsAndCoursesToVisit(SId, GId, SName) : \neg Course(CId, _, CName)$
- SQL: `select (S.SName, C.CId, C.CName) from S, C where exists (select * from P where P.CId = C.CId and P.GId = S.GId);`

7. По лектору всех студентов, у которых он хоть что-нибудь преподавал

- Кортежи: `select S.SId, S.GId, S.SName from S where $\exists P(\exists L(L.LName = fixLecturerName \wedge L.LId = P.LId \wedge P.GId = S.GId))$`
- Datalog: $StudentsAndCoursesToVisit(SId, GId, SName) : \neg Student(SId, GId, SName)$
 $StudentsAndCoursesToVisit(SId, GId, SName) : \neg Plan(LId, _, GId)$
 $StudentsAndCoursesToVisit(SId, GId, SName) : \neg Lecturer(LId, LName)$
 $StudentsAndCoursesToVisit(SId, GId, SName) : \neg LName = fixLecturerName$
- SQL: `select (S.SId, S.GId, S.SName) from S where exists (select * from P where exists (select * from L where L.LName = fixLecturerName and L.LId = P.LId and P.GId = S.GId));`

8. Пары студентов, такие, что все сданные первым студентом предметы сдал и второй студент

- Кортежи: `select S1.SId, S1.SName, S2.SId, S2.SName from S, S where $\forall P(\forall M1, M2 :: M(P.CId <> M1.CId \vee P.CId <> M2.CId \vee M1.CId <> S1.CId \vee M1.GId <> S1.GId \vee M1.SId <> S1.SId \vee M.mark < 60 \vee M2.CId <> S2.CId \vee M2.GId <> S2.GId \vee M2.SId <> S2.SId \vee M.mark \geq 60))$`
- Datalog: $PairsOfStudents(SId1, SName1, SId2, SName2) : \neg Student(SId1, GId1, SName1)$
 $PairsOfStudents(SId1, SName1, SId2, SName2) : \neg Student(SId2, GId2, SName2)$
 $PairsOfStudents(SId1, SName1, SId2, SName2) : \neg Plan(_, CId, GId1)$
 $PairsOfStudents(SId1, SName1, SId2, SName2) : \neg Plan(_, CId, GId2)$
 $PairsOfStudents(SId1, SName1, SId2, SName2) : \neg Mark(SId1, CId, GId1, Mark1)$
 $PairsOfStudents(SId1, SName1, SId2, SName2) : \neg Mark(SId2, CId, GId2, Mark2)$
 $PairsOfStudents(SId, GId, SName) : \neg Mark1 < 60, Mark2 \geq 60$
- SQL: `select S1.SId, S1.SName, S2.GId, S2.SName from S as S1, S as S2 where not exists (select * from P where not exists (select * from M as M1 where not exists (select * from M as M2 where P.CId <> M1.CId or P.CId <> M2.CId or M1.CId <> S1.CId or M1.GId <> S1.GId or M1.SId <> S1.SId or M.mark < 60 or M2.CId <> S2.CId or M2.GId <> S2.GId or M2.SId <> S2.SId or M.mark >= 60))));`