

**Министерство науки и высшего образования Российской Федерации**  
федеральное государственное автономное образовательное учреждение высшего  
образования  
**«НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО»**

**Отчет**

по Лабораторной Работе № 2

по дисциплине «Проектирование и реализация баз данных»

Вариант 2

Автор: Тихонова Ксения Евгеньевна

Факультет: ФИКТ

Группа: К32402

Преподаватель: Говорова Марина Михайловна

**itmo**

Санкт-Петербург

## Задание 2. Создание запросов.











**1. Список дисциплин, которые должны быть сданы заданной группой с указанием дат сдачи и фамилий преподавателей:**

```
SELECT plan_disc.id_program_disc, attestation.att_date, teacher.name_teacher
FROM lab.attestation
JOIN lab.plan_disc ON attestation.id_program_disc = plan_disc.id_program_disc
JOIN lab.teacher ON attestation.id_teacher = teacher.id_teacher
JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying
WHERE is_studying.id_group = 'Group1';
```

Query Query History

```
1 SELECT plan_disc.id_program_disc, attestation.att_date, teacher.name_teacher
2 FROM lab.attestation
3 JOIN lab.plan_disc ON attestation.id_program_disc = plan_disc.id_program_disc
4 JOIN lab.teacher ON attestation.id_teacher = teacher.id_teacher
5 JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying
6 WHERE is_studying.id_group = 'Group1';
7
8
9 |
```

Data Output Messages Notifications



	id_program_disc character varying	att_date date	name_teacher character varying
1	PD1	2023-05-01	Екатерина Лопатина
2	PD1	2023-05-02	Петров Петр Петрович
3	PD2	2023-05-06	Сидоров Сидор Сидорович
4	PD2	2023-05-07	Алексеев Алексей Алексеевич

**2. Список студентов, получивших двойки на первой попытке с указанием фамилии преподавателя, которым они должны пересдать экзамен:**

```
SELECT student.full_name, teacher.name_teacher
FROM lab.attestation
JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying
JOIN lab.teacher ON attestation.id_teacher = teacher.id_teacher
JOIN lab.student ON is_studying.id_student = student.id_student
WHERE attestation.number_attempt = 1 AND attestation.grade = 2;
```

Query
Query History

```

1 SELECT student.full_name, teacher.name_teacher
2 FROM lab.attestation
3 JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying
4 JOIN lab.teacher ON attestation.id_teacher = teacher.id_teacher
5 JOIN lab.student ON is_studying.id_student = student.id_student
6 WHERE attestation.number_attempt = 1 AND attestation.grade = 2;
7
8

```

Data Output
Messages
Notifications

	full_name character varying	name_teacher character varying
1	Мария Смирнова	Алексеев Алексей Алексеевич

### 3. Фамилии студентов, получивших оценки по дисциплине, которые выше среднего балла по этой дисциплине:

```

SELECT student.full_name, attestation.id_program_disc
FROM lab.attestation
JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying
JOIN lab.student ON is_studying.id_student = student.id_student
GROUP BY student.full_name, attestation.id_program_disc, attestation.grade
HAVING attestation.grade > (SELECT AVG(grade) FROM lab.attestation WHERE id_program_disc IN
                             (SELECT attestation.id_program_disc FROM lab.attestation
                              GROUP BY attestation.id_program_disc));

```

Смотрим оценки:

	att_date [PK] date	grade real	number_attempt integer	id_program_disc character varying	id_is_studying character varying	id_teacher integer
1	2023-05-01	4.5	1	PD1	IS1	1
2	2023-05-06	4	1	PD2	IS1	3
3	2023-05-07	2	1	PD2	IS2	4
4	2023-06-25	4	2	PD1	IS3	1
5	2023-05-29	2	2	PD1	IS3	1
6	2023-05-27	5	1	PD1	IS4	2
7	2023-05-02	5	2	PD1	IS2	2

Смотрим результат:

```

1 SELECT student.full_name, attestation.id_program_disc
2 FROM lab.attestation
3 JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying
4 JOIN lab.student ON is_studying.id_student = student.id_student
5 GROUP BY student.full_name, attestation.id_program_disc, attestation.grade
6 HAVING attestation.grade > (SELECT AVG(grade) FROM lab.attestation WHERE id_program_disc IN
7                             (SELECT attestation.id_program_disc FROM lab.attestation
8                              GROUP BY attestation.id_program_disc));
9
10 select * from lab.attestation
11

```

Data Output Messages Notifications



	full_name character varying	id_program_disc character varying
1	Иван Иванов	PD2
2	Мария Смирнова	PD1
3	Дмитрий Рубежкин	PD1
4	Георгий Константинов	PD1
5	Иван Иванов	PD1

#### 4. Рейтинговый список групп по заданному направлению по результатам сдачи сессии, упорядоченный по убыванию:

```

SELECT g.id_group, AVG(a.grade) AS avg_grade
FROM lab.attestation a
JOIN lab.is_studying s ON a.id_is_studying = s.id_is_studying
JOIN lab.l_group g ON s.id_group = g.id_group
JOIN lab.plan_disc pd on a.id_program_disc = pd.id_program_disc
JOIN lab.plan p ON pd.id_plan = p.id_plan
JOIN lab.program on p.id_program = program.id_program
WHERE program.id_spec = 'Spec1'
GROUP BY g.id_group
ORDER BY avg_grade DESC;

```

```

1 SELECT l_group.id_group, AVG(attestation.grade) AS avg_grade
2 FROM lab.attestation
3
4 JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying
5 JOIN lab.l_group ON is_studying.id_group = l_group.id_group
6 JOIN lab.plan_disc ON attestation.id_program_disc = plan_disc.id_program_disc
7 JOIN lab.plan ON plan_disc.id_plan = plan.id_plan
8 JOIN lab.program ON plan.id_program = program.id_program
9 WHERE program.id_spec = 'Spec1'
10
11 GROUP BY l_group.id_group
12 ORDER BY avg_grade DESC;
13

```

Data Output Messages Graph Visualiser x Notifications

	id_group [PK] character varying	avg_grade double precision
1	Group2	3.6666666666666665
2	Group1	3.375

## 5. Списки студентов, упорядоченные по группам и фамилиям студентов, содержащие данные о средних баллах и назначении на стипендии:

```

SELECT gr.id_group, st.full_name,
CASE WHEN (COUNT(CASE WHEN rs.id_receiving_sch != '0' THEN rs.id_receiving_sch END) > 0)
AND (COUNT(CASE WHEN att.grade <= 3 THEN 1 END) = 0)
THEN 1 ELSE 0 END AS scholarship_status,
AVG(att.grade) AS avg_grade
FROM lab.attestation att
JOIN lab.is_studying i_s ON att.id_is_studying = i_s.id_is_studying
JOIN lab.student st ON i_s.id_student = st.id_student
JOIN lab.l_group gr ON i_s.id_group = gr.id_group
LEFT JOIN lab.receiving_sch rs ON i_s.id_is_studying = rs.id_studying
GROUP BY gr.id_group, st.full_name;

```

- Снимаем со стипендии тех, кто имеет балл ниже тройки, а также тех, кто изначально её не имел – контрактников, у которых '0' в rs.id\_receiving\_sch

```

1 SELECT gr.id_group, st.full_name,
2        CASE WHEN (COUNT(CASE WHEN rs.id_receiving_sch != '0' THEN rs.id_receiving_sch END) > 0)
3        AND (COUNT(CASE WHEN att.grade <= 3 THEN 1 END) = 0)
4        THEN 1 ELSE 0 END AS scholarship_status,
5        AVG(att.grade) AS avg_grade
6 FROM lab.attestation att
7 JOIN lab.is_studying i_s ON att.id_is_studying = i_s.id_is_studying
8 JOIN lab.student st ON i_s.id_student = st.id_student
9 JOIN lab.l_group gr ON i_s.id_group = gr.id_group
10 LEFT JOIN lab.receiving_sch rs ON i_s.id_is_studying = rs.id_studying
11 GROUP BY gr.id_group, st.full_name;
12

```

Data Output Messages Graph Visualiser x Notifications

	id_group character varying	full_name character varying	scholarship_status integer	avg_grade double precision
1	Group1	Иван Иванов	1	4.25
2	Group1	Мария Смирнова	0	2.5
3	Group2	Георгий Константинов	0	3
4	Group2	Дмитрий Рубежкин	0	5

## 6. Список студентов, сдавших все положенные экзамены:

Видим нашу двойку и null

	att_date [PK] date	grade real	number_attempt integer	id_program_disc character varying	id_is_studying character varying	id_teacher integer
1	2023-05-01	4.5	1	PD1	IS1	1
2	2023-05-06	4	1	PD2	IS1	3
3	2023-06-25	4	2	PD1	IS3	1
4	2023-05-29	2	2	PD1	IS3	1
5	2023-05-27	5	1	PD1	IS4	2
6	2023-05-02	5	2	PD1	IS2	2
7	2023-05-07	[null]	1	PD2	IS2	4

```
SELECT st.full_name, i_s.id_is_studying
```

```
FROM lab.is_studying i_s
```

```
JOIN lab.student st ON i_s.id_student = st.id_student
```

```
WHERE i_s.id_is_studying NOT IN (
```

```
    SELECT att.id_is_studying
```

```
    FROM lab.attestation att
```

```
        JOIN lab.is_studying i_s ON att.id_is_studying = i_s.id_is_studying
```

```
        LEFT JOIN lab.plan_disc ON att.id_program_disc = plan_disc.id_program_disc
```

```
        WHERE att.grade <= 2 OR att.grade IS NULL
```

```
)
```

Обнаружили два двоечника, осталось два хороших студента.

	full_name character varying	id_is_studying character varying
1	Иван Иванов	IS1
2	Дмитрий Рубежкин	IS4

### 7. Список студентов, получивших максимальный средний балл в своей группе:

```

SELECT gr.id_group, st.full_name, AVG(att.grade) AS avg_grade
FROM lab.attestation att
JOIN lab.is_studying i_s ON att.id_is_studying = i_s.id_is_studying
JOIN lab.l_group gr ON i_s.id_group = gr.id_group
JOIN lab.student st ON i_s.id_student = st.id_student
GROUP BY gr.id_group, st.full_name
HAVING AVG(att.grade) >= (
    SELECT AVG(att.grade)
    FROM lab.attestation att
    JOIN lab.is_studying i_s ON att.id_is_studying = i_s.id_is_studying
    JOIN lab.l_group gr ON i_s.id_group = gr.id_group
    WHERE gr.id_group = gr.id_group
);

```

Query
Query History

```

1 SELECT gr.id_group, st.full_name, AVG(att.grade) AS avg_grade
2 FROM lab.attestation att
3 JOIN lab.is_studying i_s ON att.id_is_studying = i_s.id_is_studying
4 JOIN lab.l_group gr ON i_s.id_group = gr.id_group
5 JOIN lab.student st ON i_s.id_student = st.id_student
6 GROUP BY gr.id_group, st.full_name
7 HAVING AVG(att.grade) >= (
8     SELECT AVG(att.grade)
9     FROM lab.attestation att
10    JOIN lab.is_studying i_s ON att.id_is_studying = i_s.id_is_studying
11    JOIN lab.l_group gr ON i_s.id_group = gr.id_group
12    WHERE gr.id_group = gr.id_group
13 );
14

```

Data Output
Messages
Graph Visualiser
Notifications

	id_group character varying	full_name character varying	avg_grade double precision
1	Group2	Дмитрий Рубежкин	5
2	Group1	Иван Иванов	4.25

### Задание 3. Создание представлений.

**1. Список студентов, получивших двойки на первой попытке с указанием фамилии преподавателя, которым они должны пересдать экзамен:**

```
CREATE VIEW lab.view_attempt_fail AS

SELECT student.full_name, teacher.name_teacher

FROM lab.attestation

JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying

JOIN lab.teacher ON attestation.id_teacher = teacher.id_teacher

JOIN lab.student ON is_studying.id_student = student.id_student

WHERE attestation.number_attempt = 1 AND attestation.grade = 2;
```

```
1 CREATE VIEW lab.view_attempt_fail AS
2 SELECT student.full_name, teacher.name_teacher
3 FROM lab.attestation
4 JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying
5 JOIN lab.teacher ON attestation.id_teacher = teacher.id_teacher
6 JOIN lab.student ON is_studying.id_student = student.id_student
7 WHERE attestation.number_attempt = 1 AND attestation.grade = 2;
8
9 |
```

Data Output Messages Graph Visualiser × Notifications

CREATE VIEW

Query returned successfully in 94 msec.

**2. Данных о студентах при получении ими хотя бы одной оценки 2 (после 3-й попытки):**

```
CREATE VIEW lab.view_failed_students AS

SELECT student.full_name, attestation.grade

FROM lab.attestation

JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying

JOIN lab.student ON is_studying.id_student = student.id_student

WHERE attestation.number_attempt > 3 AND attestation.grade = 2;
```



```
1 CREATE VIEW lab.view_failed_students AS
2 SELECT student.full_name, attestation.grade
3 FROM lab.attestation
4 JOIN lab.is_studying ON attestation.id_is_studying = is_studying.id_is_studying
5 JOIN lab.student ON is_studying.id_student = student.id_student
6 WHERE attestation.number_attempt > 3 AND attestation.grade = 2;
7 |
```

Data Output Messages Graph Visualiser x Notifications

CREATE VIEW

Query returned successfully in 128 msec.

## INSERT, DELETE, UPDATE

1. Вставить новую запись о студенте в таблицу "student" только если этого студента еще нет в базе данных.

До:

	id_student [PK] integer	full_name character varying	average_grade numeric
1	1	Иван Иванов	4.25
2	2	Мария Смирнова	2.5
3	3	Георгий Константинов	3
4	4	Дмитрий Рубежкин	5

Команда:

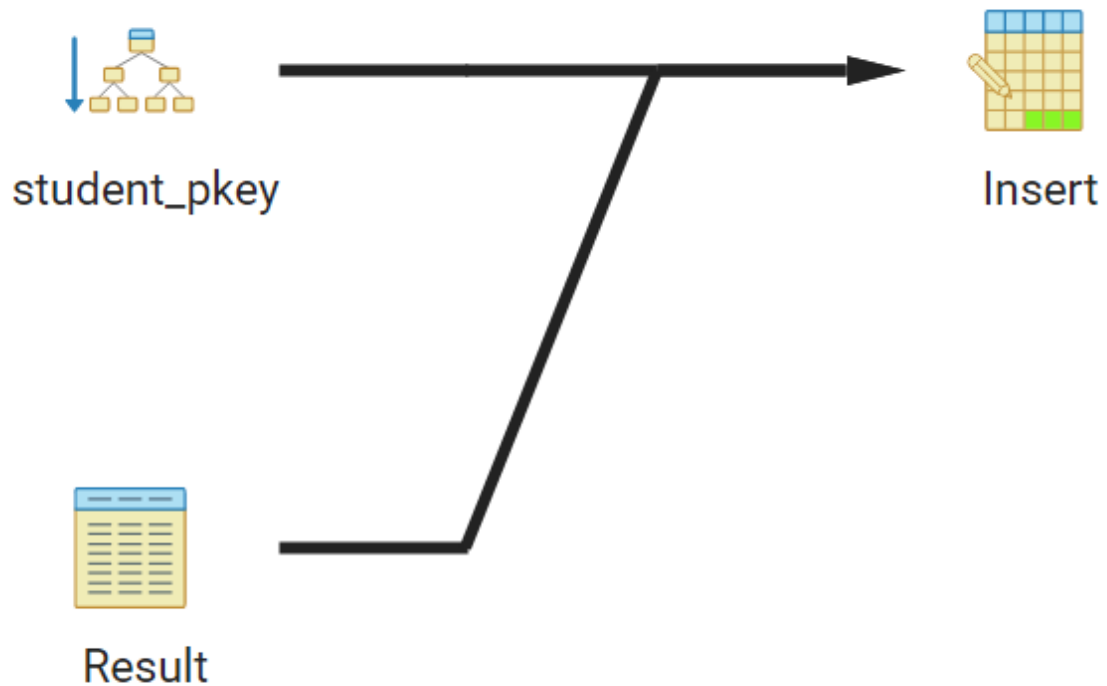
```
INSERT INTO lab.student (id_student, full_name)
```

```
SELECT 66, 'Захар Допсин'
```

```
WHERE NOT EXISTS (SELECT 1 FROM lab.student WHERE id_student = 66);
```

После:

	id_student [PK] integer	full_name character varying
1	1	Иван Иванов
2	2	Мария Смирнова
3	3	Георгий Константинов
4	4	Дмитрий Рубежкин
5	66	Захар Допсин



2. Обновить количество студентов в группе в таблице l\_group на основе количества записей о студентах в таблице is\_studying для каждой группы.

До:

	id_group [PK] character varying	from date	to date	amount_students integer	year integer	group_number character varying	id_plan character varying
1	Group1	2021-09-01	[null]	30	3	G1	Plan1
2	Group2	2021-09-01	[null]	25	3	G2	Plan1

Команда:

```
UPDATE lab.l_group
```

```
SET amount_students = (
```

```
    SELECT COUNT(*)
```

```
    FROM lab.is_studying
```

```
    WHERE lab.l_group.id_group = lab.is_studying.id_group
```

```
)
```

```
WHERE EXISTS (
```

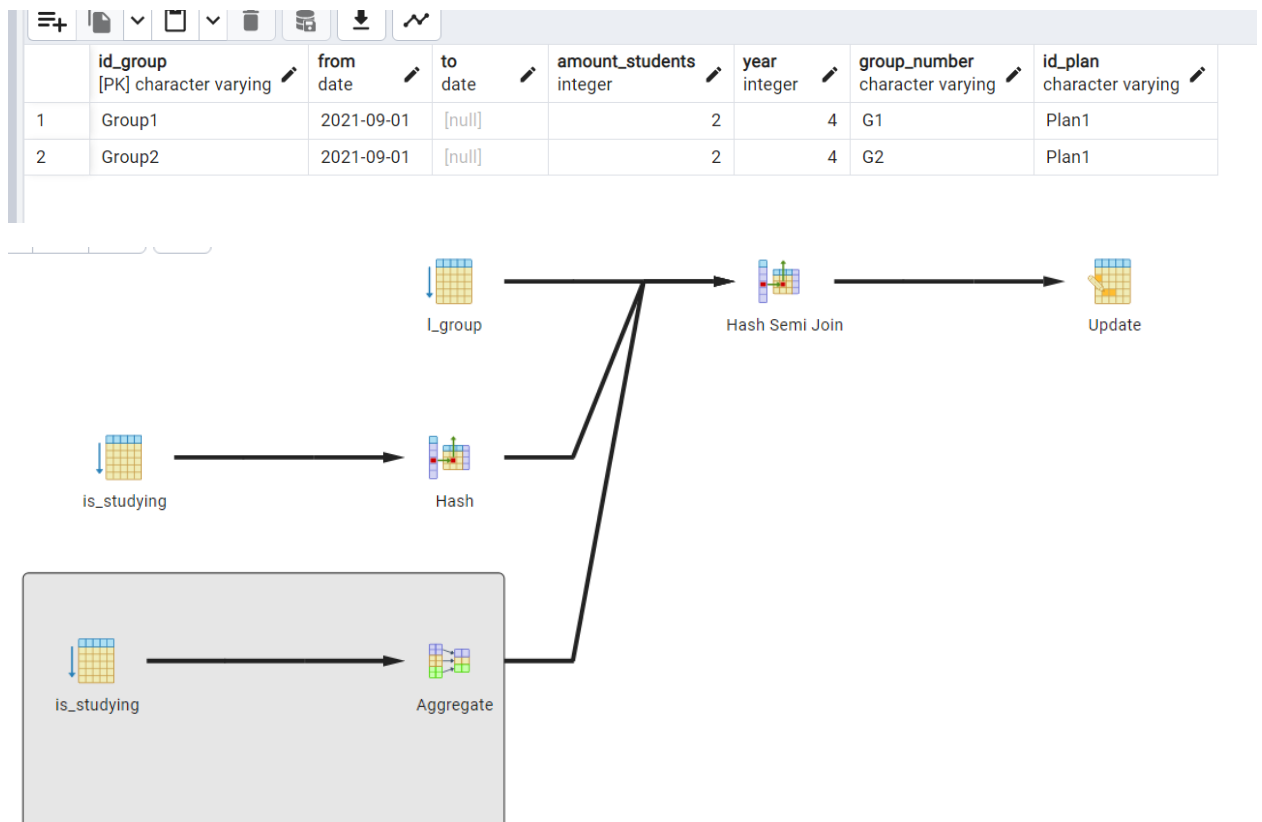
```
    SELECT 1
```

```
    FROM lab.is_studying
```

```
    WHERE lab.l_group.id_group = lab.is_studying.id_group
```

```
);
```

После:



3. Удалить все записи о преподавателях из таблицы teacher, которые не связаны ни с одним предметом в таблице plan\_disc.

До:

	id_teacher [PK] integer	name_teacher character varying	position character varying
1	1	Екатерина Лопатина	Профессор
2	2	Петров Петр Петрович	Доцент
3	3	Сидоров Сидор Сидорович	Старший преподаватель
4	4	Алексеев Алексей Алексеевич	Преподаватель
5	6	Наталья Отличина	Ассистент Профессора

Команда:

```
DELETE FROM lab.teacher
```

```
WHERE NOT EXISTS (
```

```
  SELECT 1
```

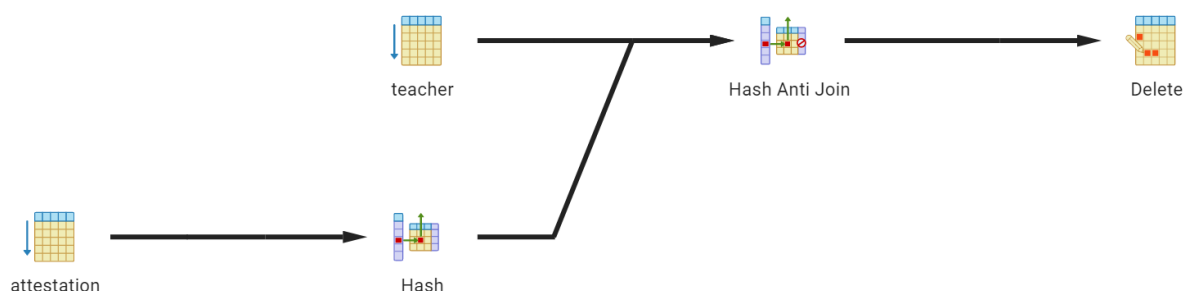
```
  FROM lab.attestation
```

```
  WHERE lab.teacher.id_teacher = lab.attestation.id_teacher
```

```
);
```

После:

	id_teacher [PK] integer	name_teacher character varying	position character varying
1	1	Екатерина Лопатина	Профессор
2	2	Петров Петр Петрович	Доцент
3	3	Сидоров Сидор Сидорович	Старший преподаватель
4	4	Алексеев Алексей Алексеевич	Преподаватель



## Индексы

Запрос на индексирование команды UPDATE (см. выше):

```
CREATE INDEX index_id_group_is ON lab.is_studying (id_group);
```

```
CREATE INDEX index_id_group_l ON lab.l_group (id_group);
```

До:

Query returned successfully in 146 msec.

После:

Query returned successfully in 97 msec.

Ускорили в 30%.

**Удаление индексов:**

```
DROP INDEX index_id_group_is;
```

```
DROP INDEX index_id_group_l;
```

## Вывод:

В данной лабораторной работе были изучены возможности создания запросов и представлений. Успешно созданы 7 запросов и 2 представления. Их вывод представлен в лабораторной работе. Также были созданы запросы UPDATE, INSERT, DELETE и созданы индексы.