

**Министерство науки и высшего образования Российской Федерации
ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ ОБРАЗОВАТЕЛЬНОЕ
УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО**

ОТЧЕТ

ПО ЛАБОРАТОРНОЙ РАБОТЕ № 4

**«ЗАПРОСЫ НА ВЫБОРКУ И МОДИФИКАЦИЮ ДАННЫХ.
ПРЕДСТАВЛЕНИЯ. РАБОТА С ИНДЕКСАМИ»**

по дисциплине «Проектирование и реализация баз данных»

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Санкт-Петербург
2024/2025

	Reader_name character varying (50)	Reader_surname character varying (50)	Reader_lastname character varying (50)	Address character varying (50)	Phone_number character varying (50)
1	Aurora	Ann	Howl	Brown Street 1	+79159936485
2	Karina	Christmas	Dior	Tyazhelbiy lux 99	+79123456789
3	Olaf	Laf	Tuhel	Hogvarts street 52	+79345679234

- Вывести список читателей, не вернувших в срок книги и имеющих на руках более десяти книг.

```
Select P.name, P.surname, P.lastname, P.address, P.phone_number from "Library"."Reading" as R Left Join "Library"."Reader" as RR
On R.library_card_number = RR.library_card_number Left Join "Library"."People" as P On RR.people_id = P.people_id
Where R.library_card_number in (Select library_card_number from "Library"."Reading" Where CURRENT_DATE > receipt_date + INTERVAL '21 days'
and (returned = false or returned_on_time = false) Group by library_card_number Having count(*) >= 1)
Group by R.library_card_number, P.people_id
Having count(R.library_card_number) > 10
```

	name character varying (50)	surname character varying (50)	lastname character varying (50)	address character varying (50)	phone_number character varying (50)
1	Olaf	Laf	Tuhel	Hogvarts street 52	+79345679234

- вывести список изданий, которые были наиболее популярными у читателей за предыдущий календарный год.

```
Select B.*, count(*) from "Library"."Book" as B Left Join "Library"."Copy_book" as CB On B.book_id = CB.book_id
Left Join "Library"."Reading" as R On CB.copy_id = R.copy_id
Where reading_id is not null and receipt_date > CURRENT_DATE - INTERVAL '1 year'
Group by B.book_id
Order by count(*) desc
Limit 3
```

	book_id integer	author character varying (150)	name character varying (150)	volume_number integer	compiled_by character varying (200)	original_language character varying (50)	translator character varying (200)	year_of_issue date	count bigint
1	12	Viktor Dashkevich	Imperatorskiy div	1	Viktor Dashkevich	Russian	Nothing	2022-12-28	3
2	20	Arthur Heiley	Airport	1	Arthur Heiley	English	T. Кудряцева	1968-03-02	2
3	11	Viktor Dashkevich	Graf Averin	1	Viktor Dashkevich	Russian	Nothing	2022-10-24	2

- Вывести список книг, которые находятся в библиотеке в единственном экземпляре.

```
Select author, name, count(*) as copies_in_the_library from "Library"."Book" as B
Left Join "Library"."Copy_book" as CB On B.book_id = CB.book_id
Where rack_id is not null
Group by b.book_id
Having count(*) = 1
```

	author character varying (150)	name character varying (150)	copies_in_the_library bigint
1	Slava Marlow	С# для профессионалов	1
2	Slava Marlow	С# для продвинутых	1
3	Nikolay Sobolev	Мой путь к успеху	1
4	Slava Marlow	С# для чайников	1
5	Guseyn Gasanov	Гусейн Гасанов	1
6	Slava Marlow	Фишки С#	1
7	Aleg Camry	152 подката	1
8	Aleg Camry	Сборник лучших анекдотов 2002	1

- Подсчитать количество читателей, которые не обращались в библиотеку в течение года.

```
Select count(*) as have_not_borrowed_books_for_over_a_year from "Library"."Reader"
Where library_card_number not in (Select distinct R.library_card_number from "Library"."Reader" as R
Left Join "Library"."Reading" as RR On R.library_card_number = RR.library_card_number
Where receipt_date > CURRENT_DATE - INTERVAL '1 year')
```

	have_not_borrowed_books_for_over_a_year	
	bigint	
1		5

- Подсчитать количество читателей библиотеки по уровню образования.

```
Select education, count(*) from "Library"."People"
Where role = 'reader'
Group by education
Order by count(*) desc
```

	education	count
	character varying (75)	bigint
1	higher education	4
2	schoolboy	4
3	incomplete higher education	2

- Вывести список книг по программированию на C#, экземпляры которых отсутствуют в библиотеке, и которые должны быть возвращены не позднее, чем через 3 дня.

```
Select B.book_id, author, name, CB.copy_id, type_publication, inventory_number, rack_id
from "Library"."Book" as B Left Join "Library"."Copy_book" as CB On B.book_id = CB.book_id
Left Join "Library"."Reading" as R On CB.copy_id = R.copy_id
Where name like '%C#%' and returned = false and CURRENT_DATE < receipt_date + INTERVAL '21 days'
and CURRENT_DATE >= receipt_date + INTERVAL '18 days'
```

	book_id	author	name	copy_id	type_publication	inventory_number	rack_id
	integer	character varying (150)	character varying (150)	integer	character varying (150)	integer	integer
1	41	Slava Marlow	C# для продвинутых	63	Paperback	998	22
2	42	Slava Marlow	C# для профессионалов	64	Paperback	997	23

2) Создание представлений:

- сведения о должниках

```
SELECT DISTINCT p.name,
p.surname,
p.lastname,
p.address,
p.phone_number,
p.education
FROM "Library"."Reading" r
LEFT JOIN "Library"."Reader" rr ON r.library_card_number = rr.library_card_number
LEFT JOIN "Library"."People" p ON rr.people_id = p.people_id
WHERE r.returned = false;
```

```
SELECT * FROM "Library"."Information about debtors"
```

	name character varying (50)	surname character varying (50)	lastname character varying (50)	address character varying (50)	phone_number character varying (50)	education character varying (75)
1	Albus	Severus	Duwwdor	Hogvarts street 3	+79567845682	schoolboy
2	John	Deivy	Harris	Food Cort 14	+79529935242	higher education
3	Olaf	Laf	Tuhel	Hogvarts street 52	+79345679234	schoolboy

- сведения о наиболее популярных книгах (все экземпляры находятся на руках у читателей).

```
WITH book_count AS (
    SELECT "Copy_book".book_id,
           count(*) AS count_on_library
    FROM "Library"."Copy_book"
    WHERE "Copy_book".rack_id IS NOT NULL
    GROUP BY "Copy_book".book_id
), on_hands_book AS (
    SELECT b_1.book_id,
           count(*) AS count_on_hands
    FROM "Library"."Book" b_1
    LEFT JOIN "Library"."Copy_book" cb_1 ON b_1.book_id = cb_1.book_id
    LEFT JOIN "Library"."Reading" r_1 ON cb_1.copy_id = r_1.copy_id
    WHERE r_1.receipt_date >= (CURRENT_DATE - '21 days'::interval)
    GROUP BY b_1.book_id
)
SELECT b.book_id,
       b.author,
       b.name,
       b.volume_number,
       b.compiled_by,
       b.original_language,
       b.translator,
       b.year_of_issue
FROM "Library"."Book" b
LEFT JOIN "Library"."Copy_book" cb ON b.book_id = cb.book_id
LEFT JOIN "Library"."Reading" r ON cb.copy_id = r.copy_id
WHERE r.receipt_date >= (CURRENT_DATE - '21 days'::interval) AND (b.book_id IN ( SELECT ohb.book_id
                                         FROM on_hands_book ohb
                                         JOIN book_count bc ON ohb.book_id = bc.book_id AND bc.count_on_library = ohb.count_on_hands));
```

```
SELECT * FROM "Library"."Most popular books"
```

	book_id integer	author character varying (150)	name character varying (150)	volume_number integer	compiled_by character varying (200)	original_language character varying (50)	translator character varying (200)	year_of_issue date
1	41	Slava Marlow	C# для продвинутых	1	Slava Marlow	Russian	Nothing	2019-07-01
2	42	Slava Marlow	C# для профессионалов	1	Slava Marlow	Russian	Nothing	2021-01-01

3) Запросы на модификацию данных:

INSERT:

До (Copy_book и Rack соответственно):

	copy_id [PK] integer ↗	library_cipher character varying (100) ↗	type_publication character varying (150) ↗	price integer ↗	publishing_house character varying (150) ↗	inventory_number integer ↗	book_id integer ↗	rack_id integer ↗	year_publication integer ↗
1	69	R710LC	Paperback	999	ЭКСМО	992	47	28	2019
2	68	R710LC	Paperback	199	ЭКСМО	993	46	27	2016
3	67	R710LC	Paperback	199	ЭКСМО	994	45	26	2002
4	66	R710LC	Paperback	159	ЭКСМО	995	44	25	2003
5	65	R710LC	Paperback	249	ЭКСМО	996	43	24	2022
6	64	R710LC	Paperback	259	ЭКСМО	997	42	23	2021
7	63	R710LC	Paperback	189	ЭКСМО	998	41	22	2019
8	62	R710LC	Paperback	199	ЭКСМО	999	40	21	2018
9	61	R710LC	Paperback	299	ACT	24	24	20	2024
10	60	R710LC	Paperback	239	ACT	23	23	19	2024
11	59	R710LC	Paperback	239	ACT	22	22	18	2005
12	58	R710LC	Paperback	259	ACT	21	21	17	2005
13	57	R710LC	Paperback	259	ACT	20	20	16	2007
14	56	R710MC	Hardcover	499	ACT	10	20	[null]	1998
15	55	R710MC	Hardcover	439	ACT	9	24	[null]	1999

	rack_id [PK] integer ↗	shelf_number integer ↗	copy_id integer ↗
1	28	43	69
2	27	43	68
3	26	42	67
4	25	42	66
5	24	41	65
6	23	41	64
7	22	41	63
8	21	41	62
9	20	39	61
10	19	39	60
11	18	39	59
12	17	39	58

После:

	copy_id [PK] integer ↗	library_cipher character varying (100) ↗	type_publication character varying (150) ↗	price integer ↗	publishing_house character varying (150) ↗	inventory_number integer ↗	book_id integer ↗	rack_id integer ↗	year_publication integer ↗
1	71	R710MC	Paperback	349	ACT	71	21	[null]	2003
2	70	R710MC	Paperback	359	ACT	70	11	[null]	2023
3	69	R710LC	Paperback	999	ЭКСМО	992	47	28	2019
4	68	R710LC	Paperback	199	ЭКСМО	993	46	27	2016
5	67	R710LC	Paperback	199	ЭКСМО	994	45	26	2002
6	66	R710LC	Paperback	159	ЭКСМО	995	44	25	2003
7	65	R710LC	Paperback	249	ЭКСМО	996	43	24	2022
8	64	R710LC	Paperback	259	ЭКСМО	997	42	23	2021
9	63	R710LC	Paperback	189	ЭКСМО	998	41	22	2019
10	62	R710LC	Paperback	199	ЭКСМО	999	40	21	2018
11	61	R710LC	Paperback	299	ACT	24	24	20	2024
12	60	R710LC	Paperback	239	ACT	23	23	19	2024
13	59	R710LC	Paperback	239	ACT	22	22	18	2005
14	58	R710LC	Paperback	259	ACT	21	21	17	2005
15	57	R710LC	Paperback	259	ACT	20	20	16	2007
16	56	R710MC	Hardcover	499	ACT	10	20	[null]	1998
17	55	R710MC	Hardcover	439	ACT	9	24	[null]	1999
18	54	R710MC	Hardcover	439	ACT	8	23	[null]	1999

	rack_id [PK] integer	shelf_number integer	copy_id integer
1	30	42	71
2	29	42	70
3	28	43	69
4	27	43	68
5	26	42	67
6	25	42	66
7	24	41	65
8	23	41	64
9	22	41	63
10	21	41	62
11	20	39	61
12	19	39	60

```
Insert into "Library"."Copy_book" (library_cipher, type_publication, price, publishing_house, inventory_number, book_id, year_publication)
  Values ('R710MC', 'Paperback', 359, 'ACT', 70, (Select book_id from "Library"."Book" Where name = 'Graf Averin'), 2023),
        ('R710MC', 'Paperback', 349, 'ACT', 71, (Select book_id from "Library"."Book" Where name = 'Hotel'), 2003);

Insert into "Library"."Rack" (shelf_number, copy_id)
  Values (42, (Select copy_id from "Library"."Copy_book" Where inventory_number = 70)),
        (42, (Select copy_id from "Library"."Copy_book" Where inventory_number = 71));
```

UPDATE:

До:

	copy_id [PK] integer	library_cipher character varying (100)	type_publication character varying (150)	price integer	publishing_house character varying (150)	inventory_number integer	book_id integer	rack_id integer	year_publication integer
1	71	R710MC	Paperback	349	ACT	71	21	30	2003
2	70	R710MC	Paperback	359	ACT	70	11	29	2023
3	61	R710LC	Paperback	299	ACT	24	24	20	2024
4	60	R710LC	Paperback	239	ACT	23	23	19	2024
5	59	R710LC	Paperback	239	ACT	22	22	18	2005
6	58	R710LC	Paperback	259	ACT	21	21	17	2005
7	57	R710LC	Paperback	259	ACT	20	20	16	2007
8	21	R710LC	Paperback	299	ACT	50	15	10	2023
9	20	R710LC	Paperback	339	ACT	49	14	8	2023
10	19	R710LC	Paperback	339	ACT	48	13	7	2017







После:

	copy_id [PK] integer	library_cipher character varying (100)	type_publication character varying (150)	price integer	publishing_house character varying (150)	inventory_number integer	book_id integer	rack_id integer	year_publication integer
1	71	R710MC	Paperback	419	ACT	71	21	30	2003
2	70	R710MC	Paperback	429	ACT	70	11	29	2023
3	61	R710LC	Paperback	369	ACT	24	24	20	2024
4	60	R710LC	Paperback	309	ACT	23	23	19	2024
5	59	R710LC	Paperback	309	ACT	22	22	18	2005
6	58	R710LC	Paperback	329	ACT	21	21	17	2005
7	57	R710LC	Paperback	329	ACT	20	20	16	2007
8	21	R710LC	Paperback	369	ACT	50	15	10	2023
9	20	R710LC	Paperback	409	ACT	49	14	8	2023
10	19	R710LC	Paperback	409	ACT	48	13	7	2017

```
Update "Library"."Copy_book"
Set price = price + 70
Where type_publication = 'Paperback' and
      publishing_house in (Select publishing_house from "Library"."Copy_book" Where publishing_house != 'ЭКСМО')
```

DELETE:

До:

	reading_id [PK] integer 	receipt_date date 	copy_id integer 	library_card_number integer 	returned boolean 	returned_on_time boolean 
9	27	2023-12-05	63	89	true	true
10	26	2023-12-05	62	89	true	true
11	25	2025-04-19	61	89	true	true
12	24	2025-04-21	60	35	true	true
13	23	2025-04-20	58	674	true	true
14	22	2025-04-20	57	674	true	true
15	36	2024-09-25	57	674	true	true
16	21	2021-06-21	56	152	false	false
17	20	2021-06-21	55	152	false	false
18	19	2021-06-21	54	152	false	false
19	18	2021-06-21	53	152	false	false
20	17	2021-06-21	52	152	false	false
21	16	2021-06-21	51	152	false	false
22	15	2021-06-21	50	152	false	false
23	14	2021-06-21	49	152	false	false
24	13	2021-06-21	48	152	false	false
25	12	2021-06-21	47	152	false	false
26	11	2023-12-05	26	89	true	true
27	10	2023-11-14	25	89	false	false
28	8	2021-10-25	24	35	true	true

После:

	reading_id [PK] integer	receipt_date date	copy_id integer	library_card_number integer	returned boolean	returned_on_time boolean
8	37	2025-04-04	63	356	false	false
9	27	2023-12-05	63	89	true	true
10	26	2023-12-05	62	89	true	true
11	25	2025-04-19	61	89	true	true
12	24	2025-04-21	60	35	true	true
13	23	2025-04-20	58	674	true	true
14	22	2025-04-20	57	674	true	true
15	36	2024-09-25	57	674	true	true
16	11	2023-12-05	26	89	true	true
17	10	2023-11-14	25	89	false	false
18	8	2021-10-25	24	35	true	true
19	7	2021-10-25	23	35	true	true
20	6	2021-10-25	22	35	true	true
21	5	2022-03-02	21	356	true	true
22	2	2024-11-30	17	2345	true	true
23	9	2022-02-15	15	82	true	true
24	4	2024-11-30	13	2345	true	true
25	35	2024-08-14	13	35	true	true
26	34	2024-09-25	13	674	true	true
27	3	2023-01-15	12	674	true	true

```
Delete from "Library"."Reading"
Where copy_id in (Select copy_id from "Library"."Copy_book" Where rack_id is null)
```

4) Создание простого и составного индексов для двух произвольных запросов:
План запросов без индексов:

	QUERY PLAN text
1	Seq Scan on "Copy_book" (cost=0.00..1.48 rows=15 width=5...
2	Filter: (price <= 409)

	QUERY PLAN text
1	Seq Scan on "Reading" (cost=0.00..1.63 rows=6 width=18)
2	Filter: ((NOT returned) AND (receipt_date > (CURRENT_DATE - '730 days'::interva...

Создание индексов:

```
Create index idx_copy_price On "Library"."Copy_book"(price)
```

```
Create index idx_return_book On "Library"."Reading"(returned, receipt_date)
```

План запросов с индексами:

	QUERY PLAN	
	text	🔒
1	Seq Scan on "Copy_book" (cost=0.00..1.50 rows=25 width=5...	
2	Filter: (price >= 409)	

	QUERY PLAN	
	text	🔒
1	Seq Scan on "Reading" (cost=0.00..1.49 rows=5 width=18)	
2	Filter: ((NOT returned) AND (receipt_date > (CURRENT_DATE - '730 days'::interval...	

Удаление индексов:

```
Drop index "Library".idx_copy_price
```

```
Drop index "Library".idx_return_book
```

Несмотря на то, что я создал индексы, в плане запросов ничего не поменялось, скорее всего это связано с тем, что в таблицах слишком мало записей. Но при больших объемах данных индексы могут помочь сэкономить ресурсы, так как не будет происходить полный обход таблицы.

Вывод: в ходе работы я овладел практическими навыками создания представлений и запросов на выборку данных к базе данных PostgreSQL, использования подзапросов при модификации данных и индексов.