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Федеральное государственное бюджетное  
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«Заполярный государственный университет имени Н.М.  
Федоровского» Кафедра Информационных систем и  
технологий**

**Отчет: Лабораторная работа №4**

**Тема: Проектирование реляционной базы данных postgresSQL**

**По предмету: Базы данных**

**Выполнил:**

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Цель задания: Получение практических навыков работы с СУБД и языком SQL (оператор SELECT).

#### **Задание №4**

Разработать запросы к базе данных, созданной и заполненной на предыдущих лабораторных работах, следующих видов:

- a. запрос с условием на числовые данные (>, <, =, between);
- b. запрос с условием на текстовые данные (LIKE, IN);
- c. запрос с вычисляемым полем;
- d. запрос к нескольким таблицам (без явного указания JOIN);
- e. запрос с агрегирующей функцией (AVG, SUM, COUNT, MIN, MAX);
- f. запрос с группировкой (GROUP BY);
- g. запрос с сортировкой (ORDER BY);
- h. запрос с вложенным подзапросом (не менее 3 видов);
- i. запрос с оператором UNION;
- j. запрос с оператором INTERSECT;
- k. запрос с оператором EXCEPT;
- l. запрос с выражением CASE;
- m. запрос с оператором JOIN (пять видов);
- n. иерархический запрос.

SELECT \* FROM services WHERE price > 2000; SELECT \* FROM services WHERE price < 3000; SELECT \* FROM employees WHERE price= 2800; SELECT \* FROM services WHERE price BETWEEN 500 AND 3500;

ЗапросИстория запросов

1 select \* from tours  
2 where price > 2000;

Data OutputСообщенияNotifications

	id_tour [PK] integer	id_country integer	id_hotel integer	start_date date	end_date date	price integer	number_of_available_seats integer
1	2	2	2	2023-06-10	2023-06-18	2800	15
2	4	4	4	2023-08-05	2023-08-15	3200	18
3	1	1	1	2023-05-15	2023-05-22	3500	20
4	3	3	3	2023-07-01	2023-07-10	2800	25
5	5	5	5	2023-09-12	2023-09-20	4000	22

ЗапросИстория запросов

1 select \* from tours  
2 where price < 3000;

Data OutputСообщенияNotifications

	id_tour [PK] integer	id_country integer	id_hotel integer	start_date date	end_date date	price integer	number_of_available_seats integer
1	2	2	2	2023-06-10	2023-06-18	2800	15
2	3	3	3	2023-07-01	2023-07-10	2800	25

ЗапросИстория запросов

1 select \* from tours  
2 where price = 2800;

Data OutputСообщенияNotifications

	id_tour [PK] integer	id_country integer	id_hotel integer	start_date date	end_date date	price integer	number_of_available_seats integer
1	2	2	2	2023-06-10	2023-06-18	2800	15
2	3	3	3	2023-07-01	2023-07-10	2800	25

ЗапросИстория запросов

1 select \* from tours  
2 where price between 500 and 3500;

Data OutputСообщенияNotifications

	id_tour [PK] integer	id_country integer	id_hotel integer	start_date date	end_date date	price integer	number_of_available_seats integer
1	2	2	2	2023-06-10	2023-06-18	2800	15
2	4	4	4	2023-08-05	2023-08-15	3200	18
3	1	1	1	2023-05-15	2023-05-22	3500	20
4	3	3	3	2023-07-01	2023-07-10	2800	25

Скриншот №1 – Запросы с условием на числовые данные

b)

```
SELECT first_name FROM customers
```

```
WHERE first_name LIKE 'M%'
```

The screenshot shows a database query interface with a dark theme. At the top, there are tabs for 'Запрос' (Query) and 'История запросов' (Query History). The 'Запрос' tab is active, displaying a SQL query:   
1 SELECT first\_name FROM customers  
2 WHERE first\_name LIKE 'M%'  
Below the query, there are tabs for 'Data Output', 'Сообщения' (Messages), and 'Notifications'. The 'Data Output' tab is active, showing a table with one column, 'first\_name', and one row with the value 'Мария'. The column is identified as 'character varying'.

first_name
Мария

Скриншот №2 – Запрос с условием на текстовые данные

c)

```
SELECT first_name, last_name FROM customers ORDER BY
```

```
first_name desc;
```

The screenshot shows a database query interface with a dark theme. At the top, there are tabs for 'Запрос' (Query) and 'История запросов' (Query History). The 'Запрос' tab is active, displaying a SQL query:   
1 SELECT first\_name, last\_name FROM customers ORDER BY first\_name desc;  
Below the query, there are tabs for 'Data Output', 'Сообщения' (Messages), and 'Notifications'. The 'Data Output' tab is active, showing a table with two columns, 'first\_name' and 'last\_name', and five rows of data. The columns are identified as 'character varying'.

	first_name	last_name
1	Мария	Петрова
2	Иван	Иванов
3	Елена	Козлова
4	Дмитрий	Морозов
5	Алексей	Смирнов

Скриншот №3 – Запрос с вычисляемым полем

d)

```
SELECT * FROM hotels, workers WHERE workers.id_hotel = hotels.id_hotel;
```

The screenshot shows a database query interface with a dark theme. At the top, there are tabs for 'Запрос' (Query) and 'История запросов' (Query History). The 'Запрос' tab is active, displaying a SQL query:   
1 SELECT \* FROM hotels, workers WHERE workers.id\_hotel = hotels.id\_hotel;  
Below the query, there are tabs for 'Data Output', 'Сообщения' (Messages), and 'Notifications'. The 'Data Output' tab is active, showing a table with multiple columns and four rows of data. The columns are identified as 'integer' or 'character varying'.

	id_hotel	name	stars	address	room_count	board_type	rating	id_worker	id_hotel	first_name	last_name
1	1	Hilton Paris Opera	5	108 Rue Saint-Lazare, 75008 Paris, France	300	Полупансион	5	1	1	Анна	Смирнов
2	3	The Peninsula Bangkok	5	333 Charoenakorn Road, Klongsan, Bangkok 10600, Thailand	370	Полный пансион	5	2	3	Сергей	Иванов
3	2	Grand Hotel Excelsior	5	Via Veneto, 125, 00187 Roma RM, Italy	400	Все включено	5	3	2	Елена	Петрова
4	5	Sydney Harbour Marriott Hotel at Circular Quay	5	30 Pitt St, Sydney NSW 2000, Australia	550	Полный пансион	4	5	5	Марина	Морозова

Скриншот №4 – Запрос к нескольким таблицам

e)

```
SELECT AVG(price) FROM tours
```

```
SELECT SUM(price) FROM tours
```

```
SELECT COUNT(price) FROM tours
```

```
SELECT MIN(price) FROM tours
```

```
SELECT MAX(price) FROM tours
```

ЗапросИстория запросов

1SELECT AVG(price) FROM tours

Data OutputСообщенияNotifications

1	SELECT sum(price) FROM tours		
Data Output		Сообщения	Notifications
	sum bigint		
1	16300		

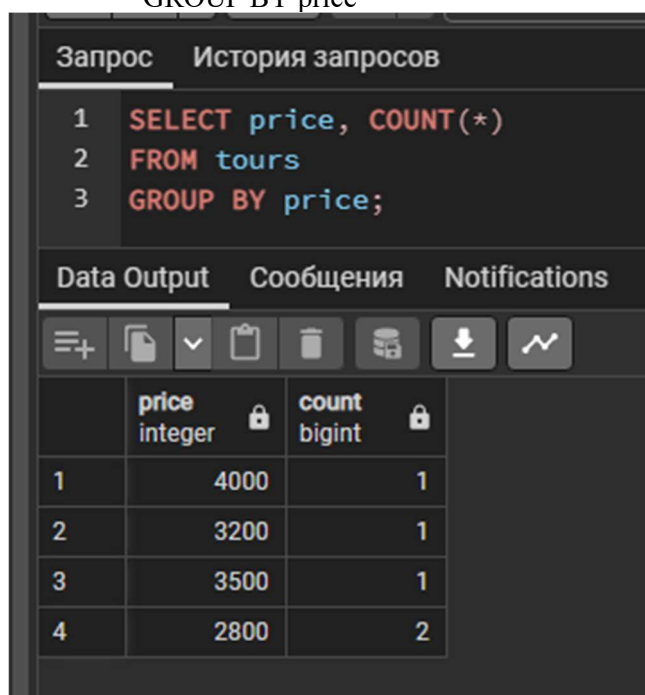
1	SELECT count(price) FROM tours		
Data Output		Сообщения	Notifications
	count bigint		
1	5		

1	SELECT min(price) FROM tours		
Data Output		Сообщения	Notifications
	min integer		
1	2800		

1	SELECT max(price) FROM tours		
Data Output		Сообщения	Notifications
	max integer		
1	4000		

f)

```
SELECT price from tours  
GROUP BY price
```



The screenshot shows a database query interface. At the top, there are two tabs: "Запрос" (Query) and "История запросов" (Query History). The "Запрос" tab is active, displaying a SQL query in a dark-themed editor. The query is:   
1 SELECT price, COUNT(\*)  
2 FROM tours  
3 GROUP BY price;  
Below the query editor, there are three tabs: "Data Output", "Сообщения" (Messages), and "Notifications". The "Data Output" tab is active, showing a table of results. Above the table is a toolbar with icons for various actions like expand, copy, paste, delete, and download. The table has two columns: "price" (integer) and "count" (bigint). The results are as follows:

	price integer	count bigint
1	4000	1
2	3200	1
3	3500	1
4	2800	2

Скриншот №6 – запрос с группировкой

h)

```
SELECT *  
FROM excursions  
WHERE cost > (SELECT AVG(cost) FROM excursions);
```

Запрос История запросов

```
1 SELECT *  
2 FROM excursions  
3 WHERE cost > (SELECT AVG(cost) FROM excursions);
```

Data Output Сообщения Notifications

	id_excursion [PK] integer	id_country integer	name character varying	description character varying	duration integer	cost integer	availability boolean	min_participants integer
1	1	1	Эйфелева башня	Панорамный вид на Париж	3	50	true	5
2	4	4	Чичен-Итца	Древний город майя	5	60	true	15
3	5	5	Сиднейская опера	Современное искусство в Австралии	3	55	true	6

Скриншот №8 – Запрос с вложенным подзапросом

i)

```
SELECT cost FROM excursions  
UNION  
SELECT price FROM tours;
```

Запрос История запросов

```
1 SELECT cost FROM excursions  
2 UNION  
3 SELECT price FROM tours;
```

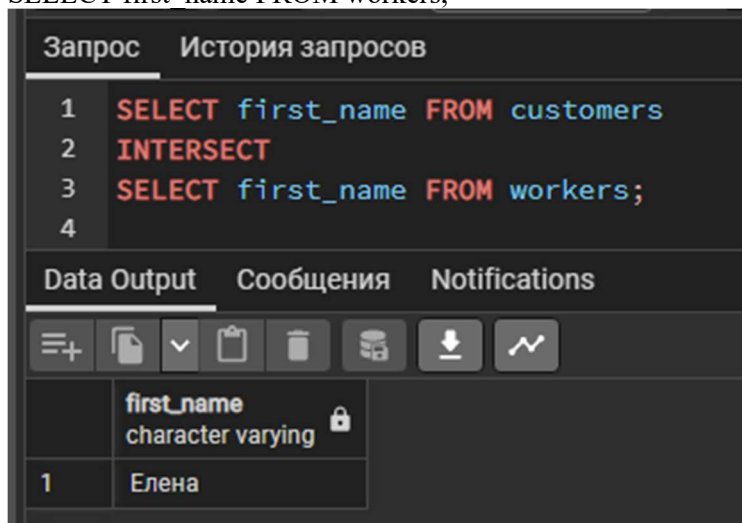
Data Output Сообщения Notifications

	cost integer
1	50
2	30
3	2800
4	4000
5	3500
6	3200
7	60
8	40
9	55

Скриншот №9 – запрос с оператором UNION

j)

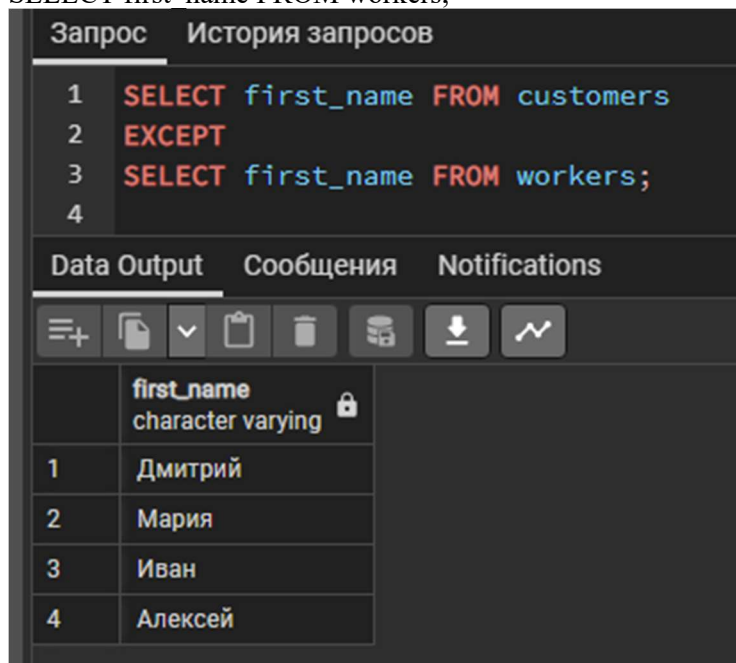
```
SELECT first_name FROM customers  
INTERSECT  
SELECT first_name FROM workers;
```



Скриншот №10 – запрос с оператором INTERSECT

k)

```
SELECT first_name FROM customers  
EXCEPT  
SELECT first_name FROM workers;
```

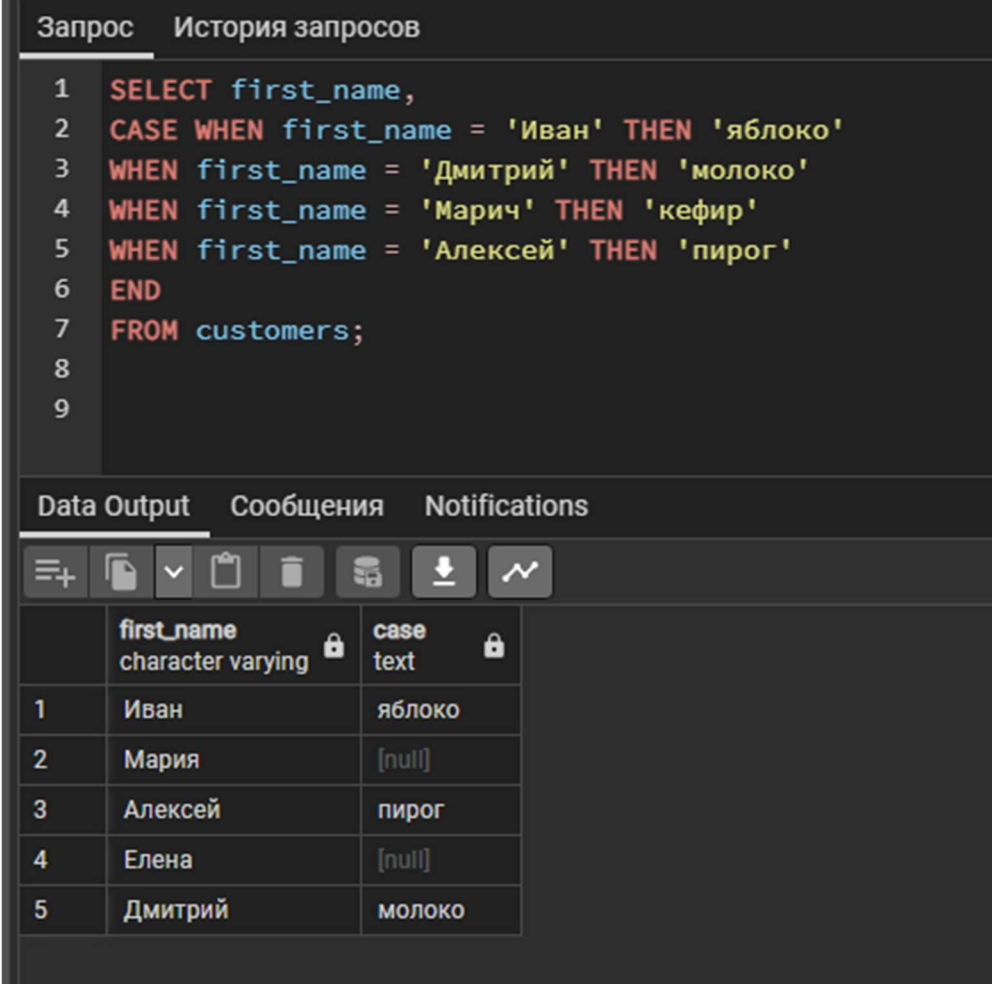


Скриншот №11 – запрос с оператором EXCEPT



1)

```
SELECT first_name,  
CASE WHEN first_name = 'Иван' THEN 'яблоко'  
WHEN first_name = 'Дмитрий' THEN 'молоко'  
WHEN first_name = 'Марич' THEN 'кефир'  
WHEN first_name = 'Алексей' THEN 'пирог'  
END  
FROM customers;
```



The screenshot displays a database interface with a query editor and a results pane. The query editor shows a SQL query using a CASE statement to map first names to products. The results pane shows the output of the query, which is a table with two columns: 'first\_name' and 'case'.

	first_name character varying	case text
1	Иван	яблоко
2	Мария	[null]
3	Алексей	пирог
4	Елена	[null]
5	Дмитрий	молоко

Скриншот №12 – запрос с оператором CASE

m)

```
SELECT * FROM workers
INNER JOIN hotels ON workers.id_hotel = hotels.id_hotel;
SELECT * FROM workers
LEFT JOIN hotels ON workers.id_hotel = hotels.id_hotel;
SELECT * FROM workers
RIGHT JOIN hotels ON workers.id_hotel = hotels.id_hotel;
SELECT * FROM workers
FULL JOIN hotels ON workers.id_hotel = hotels.id_hotel;
SELECT * FROM workers
LEFT JOIN hotels ON workers.id_hotel = hotels.id_hotel
WHERE hotels.id_hotel IS NULL;
```

Запрос

История запросов

1

SELECT \* FROM workers

2

INNER JOIN hotels ON workers.id\_hotel = hotels.id\_hotel;

Scratch Pad

x

Data Output

Сообщения

Notifications

	<div>id_worker</div> <div>integer</div>	<div>id_hotel</div> <div>integer</div>	<div>first_name</div> <div>character varying</div>	<div>last_name</div> <div>character varying</div>	<div>position</div> <div>character varying</div>	<div>salary</div> <div>integer</div>	<div>start_date</div> <div>date</div>	<div>contact_info</div> <div>character varying</div>	<div>id_hotel</div> <div>integer</div>	<div>name</div> <div>character varying</div>	<div>stars</div> <div>integer</div>	<div>address</div> <div>character varying</div>
1	1	1	Анна	Смирнова	Менеджер по продажам	30000	2023-01-15	+7 (987) 654-32-10	1	Hilton Paris Opera	5	108 Rue Saint-Lazare, 75008
2	2	3	Сергей	Иванов	Гид	25000	2023-02-01	+7 (910) 123-45-67	3	The Peninsula Bangkok	5	333 Charoennakorn Road, KJ
3	3	2	Елена	Петрова	Администратор	28000	2023-03-10	+7 (925) 678-90-12	2	Grand Hotel Excelsior	5	Via Veneto, 125, 00187 Rom
4	5	5	Марина	Морозова	Гид	26000	2023-05-20	+7 (915) 432-10-98	5	Sydney Harbour Marriott Hotel at Circular Quay	5	30 Pitt St, Sydney NSW 2000

Запрос

История запросов

1

SELECT \* FROM workers

2

LEFT JOIN hotels ON workers.id\_hotel = hotels.id\_hotel;

3

Data Output

Сообщения

Notifications

	id_worker integer	id_hotel integer	first_name character varying	last_name character varying	position character varying	salary integer	start_date date	contact_info character varying	id_hotel integer	name character varying	stars integer	address character varying
1	1	1	Анна	Смирнова	Менеджер по продажам	30000	2023-01-15	+7 (987) 654-32-10	1	Hilton Paris Opera	5	108 Rue Saint-Lazare, 75008
2	2	3	Сергей	Иванов	Гид	25000	2023-02-01	+7 (910) 123-45-67	3	The Peninsula Bangkok	5	333 Charoennakorn Road, KJ
3	3	2	Елена	Петрова	Администратор	28000	2023-03-10	+7 (925) 678-90-12	2	Grand Hotel Excelsior	5	Via Veneto, 125, 00187 Rom
4	5	5	Марина	Морозова	Гид	26000	2023-05-20	+7 (915) 432-10-98	5	Sydney Harbour Marriott Hotel at Circular Quay	5	30 Pitt St, Sydney NSW 2000

Запрос

История запросов

1 SELECT \* FROM workers

2 RIGHT JOIN hotels ON workers.id\_hotel = hotels.id\_hotel;

Scratch Pad

Data Output

Сообщения

Notifications

	<div>id_worker</div> <div>integer</div>	<div>id_hotel</div> <div>integer</div>	<div>first_name</div> <div>character varying</div>	<div>last_name</div> <div>character varying</div>	<div>position</div> <div>character varying</div>	<div>salary</div> <div>integer</div>	<div>start_date</div> <div>date</div>	<div>contact_info</div> <div>character varying</div>	<div>id_hotel</div> <div>integer</div>	<div>name</div> <div>character varying</div>	<div>stars</div> <div>integer</div>	<div>address</div> <div>character varying</div>
1	1	1	Анна	Смирнова	Менеджер по продажам	30000	2023-01-15	+7 (987) 654-32-10	1	Hilton Paris Opera	5	108 Rue Saint-Lazare, 75008
2	2	3	Сергей	Иванов	Гид	25000	2023-02-01	+7 (910) 123-45-67	3	The Peninsula Bangkok	5	333 Charoennakorn Road, KJ
3	3	2	Елена	Петрова	Администратор	28000	2023-03-10	+7 (925) 678-90-12	2	Grand Hotel Excelsior	5	Via Veneto, 125, 00187 Rom
4	5	5	Марина	Морозова	Гид	26000	2023-05-20	+7 (915) 432-10-98	5	Sydney Harbour Marriott Hotel at Circular Quay	5	30 Pitt St, Sydney NSW 2000
5	[null]	[null]	[null]	[null]	[null]	[null]	[null]	[null]	4	JW Marriott Cancun Resort & Spa	5	Blvd. Kukulcan, Km 14.5, Lot

Запрос

История запросов

1

SELECT \* FROM workers

2

FULL JOIN hotels ON workers.id\_hotel = hotels.id\_hotel;

Scratch Pad

Data Output

Сообщения

Notifications

	id_worker integer	id_hotel integer	first_name character varying	last_name character varying	position character varying	salary integer	start_date date	contact_info character varying	id_hotel integer	name character varying	stars integer	address character varying
1	1	1	Анна	Смирнова	Менеджер по продажам	30000	2023-01-15	+7 (987) 654-32-10	1	Hilton Paris Opera	5	108 Rue Saint-Lazare, 75008
2	2	3	Сергей	Иванов	Гид	25000	2023-02-01	+7 (910) 123-45-67	3	The Peninsula Bangkok	5	333 Charoennakorn Road, KJ
3	3	2	Елена	Петрова	Администратор	28000	2023-03-10	+7 (925) 678-90-12	2	Grand Hotel Excelsior	5	Via Veneto, 125, 00187 Rom
4	5	5	Марина	Морозова	Гид	26000	2023-05-20	+7 (915) 432-10-98	5	Sydney Harbour Marriott Hotel at Circular Quay	5	30 Pitt St, Sydney NSW 2000
5	[null]	[null]	[null]	[null]	[null]	[null]	[null]	[null]	4	JW Marriott Cancun Resort & Spa	5	Blvd. Kukulcan, Km 14.5, Lot

Запрос	История запросов
1	<code>SELECT * FROM workers</code>
2	<code>LEFT JOIN hotels ON workers.id_hotel = hotels.id_hotel</code>
3	<code>WHERE hotels.id_hotel IS NULL;</code>
Data Output	Сообщения
<div> <div>+</div> <div>📄</div> <div>▼</div> <div>📋</div> <div>🗑️</div> <div>🔄</div> <div>⬇️</div> <div>📈</div> </div>	
<b>id_worker</b> integer	<b>id_hotel</b> integer
<b>first_name</b> character varying	<b>last_name</b> character varying
<b>position</b> character varying	

```
with recursive booking_tree (id_booking, id_customer, id_tour, path) as (
select t1.id_booking, t1.id_customer, t1.id_tour, cast (t1.id_customer as varchar(50)) as path
from booking t1 where t1.id_customer = '1'
```

union

```
select t2.id_booking, t2.id_customer, t2.id_tour, cast (booking_tree.path || ' >>> ' || t2.id_customer as
varchar(50))
from booking t2 join booking_tree on (booking_tree.id_tour = t2.id_booking))
```

```
select id_booking, id_customer, path from booking_tree
```

Запрос	История запросов
1	<code>with recursive booking_tree (id_booking, id_customer, id_tour, path) as (</code>
2	<code>select t1.id_booking, t1.id_customer, t1.id_tour, cast (t1.id_customer as varchar(50)) as path</code>
3	<code>from booking t1 where t1.id_customer = '1'</code>
4	
5	<code>union</code>
6	
7	<code>select t2.id_booking, t2.id_customer, t2.id_tour, cast (booking_tree.path    ' &gt;&gt;&gt; '    t2.id_customer as varchar(50))</code>
8	<code>from booking t2 join booking_tree on (booking_tree.id_tour = t2.id_booking))</code>
9	
10	<code>select id_booking, id_customer, path from booking_tree</code>
11	
Data Output	Сообщения
<div> <div>+</div> <div>📄</div> <div>▼</div> <div>📋</div> <div>🗑️</div> <div>🔄</div> <div>⬇️</div> <div>📈</div> </div>	
<b>id_booking</b> integer	<b>id_customer</b> integer
	<b>path</b> character varying (50)
1	1
2	1 >>> 1
3	1 >>> 1 >>> 1
4	1 >>> 1 >>> 1 >>> 1
5	1 >>> 1 >>> 1 >>> 1 >>> 1
6	1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1
7	1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1
8	1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1
9	1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1
10	1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1 >>> 1

иерархический запрос