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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Группа: К3240

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Санкт-Петербург 2023

ЛАБОРАТОРНАЯ РАБОТА №4

Цель работы: овладеть практическими навыками создания представлений и запросов на выборку данных к базе данных PostgreSQL, использования подзапросов при модификации данных и индексов.

Оборудование: компьютерный класс.

Программное обеспечение: СУБД PostgreSQL, pgadmin 4.

Практическое задание:

- 1. Создать запросы и представления на выборку данных к базе данных PostgreSQL (согласно индивидуальному заданию, часть 2 и 3).
- 2. Составить 3 запроса на модификацию данных (INSERT, UPDATE, DELETE) с использованием подзапросов.
- 3. Изучить графическое представление запросов и просмотреть историю запросов.
- 4. Создать простой и составной индексы для двух произвольных запросов и сравнить время выполнения запросов без индексов и с индексами. Для получения плана запроса использовать команду EXPLAIN.

Вариант 4. Управление задачами

1 Develope Frontend

Создание запросов

1) Составить список всех заданий каждого проекта с указанием организаций, отделов и исполнителей, занятых в его выполнении.

```
with contract_company as (select "ContractID", "CompanyName" from "CompanyContract" join "CustomerCompany'
                                                                   ON "CustomerCompany"."CustomerCompanyID" = "CompanyContract"."CustomerCompanyID"),
           project_company as (select "ProjectName", "ProjectID", "CompanyName" from "Project" as p join
                                                                 contract_company as cc on cc."ContractID" = p."ContractID"),
           workerc department as (select "ContractID", w."DepartmentID", "DepartmentName", "WorkerID"
                                                                         from "WorkerOnContract" as w join "Department" as d on w."DepartmentID" = d."DepartmentID"),
       worker_contract as (select w."WorkerID", "ContractID", "FIO", "DepartmentID", "DepartmentName
10
11
                                                                 from workerc department wd join "Worker" w on wd."WorkerID" = w."WorkerID"),
12
          worker_ass as (select wa."ContractID", "AssignmentId", "WorkerID", "FIO", "DepartmentID", "DepartmentName"
13
                                                   from "WorkerAssignment" wa join worker_contract wc on wc."ContractID" = wa."ContractID"),
14
15
          task_ass as (select t."TaskID", "AssignmentID", "TaskName", "ProjectID", "Description"
16
17
                                             from "Task" t join "TaskAssignment" ON "TaskAssignment"."TaskID" = t."TaskID"),
18
19
           worker task as (select * from task ass ta join worker ass wa on ta. "AssignmentID" = wa. "AssignmentId").
20
21
           worker_task_project_company as (select "TaskID", "TaskName", "Description", "ContractID",
22
                                                                                                 "WorkerID", "FIO", "DepartmentID", "DepartmentName",
23
                                                                                                 pc. "ProjectID", "CompanyName"
24
                                                                                                 from worker_task wa join project_company pc on wa."ProjectID" = pc."ProjectID")
25
        select * from worker task project company:
Data Output Messages Notifications

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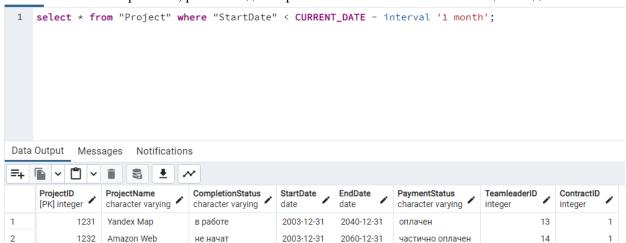
13 Vasiliy Ivanov Ivanovich

123123

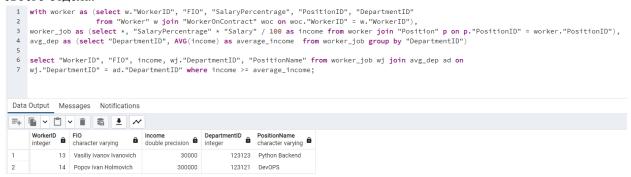
13

1231

2) Составить список проектов, работа над которыми была начата больше месяца назад.



3) Вывести список сотрудников, оклад которых превышает средний оклад сотрудников своего отлела.



4) Найти отдел, работающий над максимальным количеством проектов

123123

```
with worker as (select w."WorkerID", "FIO", "PositionID", "DepartmentID" , "ContractID"

from "Worker" w join "WorkerOnContract" woc on woc."WorkerID" = w."WorkerID"),

worker_ass as (select * from worker w join "WorkerAssignment" wa on w."ContractID" = wa."ContractID"),

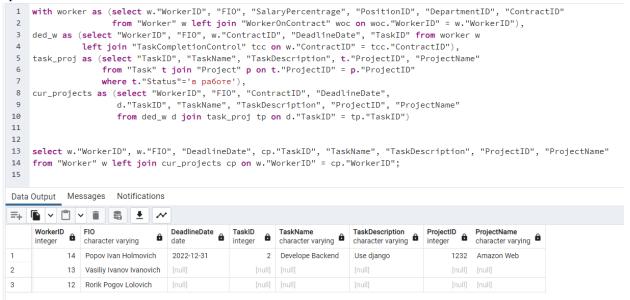
dep_proj as (select "DepartmentID", COUNT(DISTINCT "ProjectID") as project_count from worker_ass group by "DepartmentID")

select * from dep_proj where project_count = (select max(project_count) from dep_proj);

Data Output Messages Notifications

DepartmentID | project_count | projec
```

5) Составить список сотрудников, проектов, заданий, в выполнении которых они участвуют и дат предполагаемого выполнения ими заданий. Учесть сотрудников, не участвующих в проектах.



6) Составить список сотрудников, не выполнивших задания в срок с указанием проектов и заданий, которые они должны были выполнить и количества дней просрочки выполнения заданий.



7) Составить список проектов, в выполнении которого участвует более трех человек.

```
1 select wa."ProjectID", "ProjectName", count(wa."ContractID") as people
 2 from "WorkerAssignment" wa join "Project" p
 on wa."ProjectID" = p."ProjectID"
 4 group by wa. "ProjectID", "ProjectName"
 5 having count(wa."ContractID") > 3
 6 order by people desc;
 7
                                                                                Data Output Messages Notifications
=+
               ProjectName
                              people
     ProjectID
               character varying
                                     â
     integer
                              bigint
               Amazon Web
1
          1232
```

Создание представлений (View)

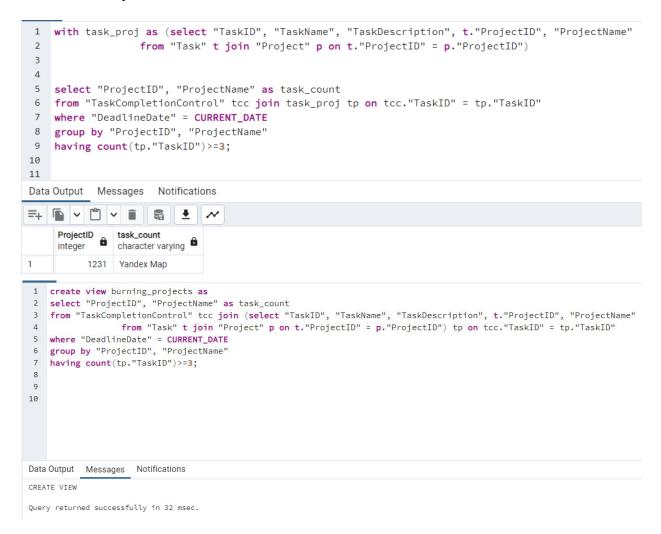
1) для руководителей проектов, содержащее сведения об исполнителях, отделах, сроках выполнения заданий, включенных в проект.

```
create view project_task_deadline as
        with contract_company as (select "ContractID", "CompanyName" from "CompanyContract" join "CustomerCompany"
  3
                                                \textbf{ON "CustomerCompany"."CustomerCompanyID" = "CompanyContract"."CustomerCompanyID"),}
  4
        project_company as (select "ProjectName", "ProjectID", "CompanyName" from "Project" as p join
                                              \verb|contract_company| \textbf{ as} | \verb|cc| on | \verb|cc."ContractID" = | \textbf{p.}"ContractID"), \\
        workerc_department as (select "ContractID", w."DepartmentID", "DepartmentName", "WorkerID"
 8
                                                   from "WorkerOnContract" as w join "Department" as d on w."DepartmentID" = d."DepartmentID"),
10
      worker_contract as (select w."WorkerID", "ContractID", "FIO", "DepartmentID", "DepartmentName"
                                              from workerc_department wd join "Worker" w on wd."WorkerID" = w."WorkerID"),
 14 worker_ass as (select wa."ContractID", "AssignmentId", "WorkerID", "FIO", "DepartmentID", "DepartmentName"
15
                                     from "WorkerAssignment" wa join worker_contract wc on wc."ContractID" = wa."ContractID"),
16
17 task_ass as (select t."TaskID", "AssignmentID", "TaskName", "ProjectID", "Description"
18 from "Task" t join "TaskAssignment" ON "TaskAssignment"."TaskID" = t."TaskID"),
19
        worker_task as (select "TaskID", wa."AssignmentId", "TaskName", "ProjectID", "Description", "ContractID", "WorkerID", "FIO", "DepartmentID", "DepartmentName"
20
                                      from task_ass ta join worker_ass wa on ta."AssignmentID" = wa."AssignmentId"),
        worker_task_ded as (select wt."TaskID", "TaskName", wt."AssignmentId", "Description", "ProjectID", wt."ContractID", "WorkerID",
23
24
                                              "FIO", "DepartmentID", "DepartmentName", "DeadlineDate", "DeadlineCompletion", "DeadlineID"
25
                                              from worker_task wt join "TaskCompletionControl" tcc on tcc."TaskID"=wt."TaskId")
26
27 select * from worker_task_ded;
28
      project_company as (select "ProjectName", "ProjectID", "CompanyName" from "Project" as p join
                                      contract_company as cc on cc."ContractID" = p."ContractID"
     workerc_department as (select "ContractID", w."DepartmentID", "DepartmentName", "WorkerID"

from "WorkerOnContract" as w join "Department" as d on w."DepartmentID" = d."DepartmentID"),
    worker_contract as (select w."WorkerID", "ContractID", "FIO", "DepartmentID", "DepartmentID", "DepartmentID", "FIO" worker_c_department wd join "Worker" w on wd."WorkerID" = w."WorkerID")
     worker_ass as (select wa."ContractID", "AssignmentId", "WorkerID", "FIO", "DepartmentID", "DepartmentName"

from "WorkerAssignment" wa join worker_contract wc on wc."ContractID" = wa."ContractID"),
      task_ass as (select t."TaskID", "AssignmentID", "TaskName", "ProjectID", "Description"
from "Task" t join "TaskAssignment" ON "TaskAssignment"."TaskID" = t."TaskID"),
    select * from worker task ded:
Data Output Messages Notifications
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```

2) список проектов, срок исполнения которых истекает сегодня и которые включают больше трех невыполненных заданий.



Модификация данных

1) Создание нового задания, с привязкой к проекту по его имени Запрос:

```
insert into "Task" ("TaskID", "ProjectID", "TaskName", "TaskDescription", "Cost", "Status")
values (30, (select "ProjectID" from "Project" where "ProjectName" like 'Amazon Web'),

'Develop frontend', 'Use figma and react.js', 15000, 'не начат')
```

До:

	TaskID [PK] integer	TaskName character varying	TaskDescription character varying	Cost integer	Status character varying	ProjectID integer
1	1	Develope Frontend	Develope React Frontend	30000	не начат	1231
2	2	Develope Backend	Use django	3000	в работе	1232

После:

	TaskID [PK] integer	TaskName character varying	TaskDescription character varying	Cost integer	Status character varying	ProjectID integer
1	1	Develope Frontend	Develope React Frontend	30000	не начат	1231
2	2	Develope Backend	Use django	3000	в работе	1232
3	30	Develop frontend	Use figma and react.js	15000	не начат	1232

2) Удаление задания по его названию и имени назначенного на него сотрудника.

Запрос:

```
1 delete from "TaskAssignment" where
2
       "TaskID" = (select "TaskID" from "Task" where "TaskName" = 'Develope Backend')
3
       and "AssignmentID" = (select "AssignmentId" from
4
           (select "AssignmentId" from "WorkerAssignment" wa join
5
           (select "ContractID" from "WorkerOnContract" wc
6
              join "Worker" w on w."WorkerID" = wc."WorkerID"
              where "FIO" like 'Popov%') fio_contract
7
8
            on fio_contract."ContractID"=wa."ContractID") as assign);
9
```

Data Output Messages Notifications

DELETE 2

Query returned successfully in 69 msec.

До:

	AssignmentID integer	TaskID integer	Id [PK] integer	Status character varying (100)	StartDate date	EndDate date	Description character varying
1	2	2	2	Не начат	2023-08-11	2023-08-24	do smth2
2	1	1	1	В работе	2023-08-11	2023-08-24	Do smth

После:

	AssignmentID integer	TaskID integer	Id [PK] integer	Status character varying (100)	StartDate date	EndDate date	Description character varying
1	1	1	1	В работе	2023-08-11	2023-08-24	Do smth

3) Повышение зарплаты сотруднику по его ФИО

Запрос:

```
update "WorkerOnContract" set "SalaryPercentrage" = 120
where "WorkerID" = (select "WorkerID" from "Worker" where "FIO" like 'Popov%')
```

До:

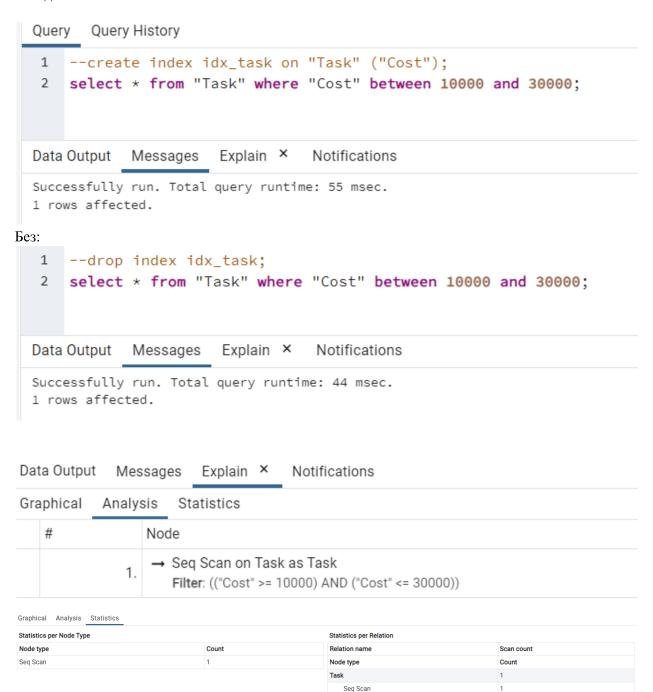
	ContractID [PK] integer	SalaryPercentrage double precision	WorkerID integer	PositionID integer	DepartmentID integer
1	1	50	13	12331	123123
2	13	100	13	12331	123123
3	14	100	14	12333	123121

После:

	ContractID [PK] integer	SalaryPercentrage double precision	WorkerID integer	PositionID integer	DepartmentID integer
1	1	50	13	12331	123123
2	13	100	13	12331	123123
3	14	120	14	12333	123121

Индекс

С индексом:



Индекс на несколько ключей:

С индексом:

```
--create index idx_task on "Task" ("TaskName", "TaskDescription");

select * from "Task" where "TaskName" like 'Develop%' and "TaskDescription" like 'Use%';

Data Output Messages Explain × Notifications

Successfully run. Total query runtime: 53 msec.

2 rows affected.
```

Без:

```
1 --drop index idx_task
2 select * from "Task" where "TaskName" like 'Develop%' and "TaskDescription" like 'Use%';

Data Output Messages Explain × Notifications

Successfully run. Total query runtime: 56 msec.
2 rows affected.

Data Output Messages Explain × Notifications

Graphical Analysis Statistics

# Node

1. Seq Scan on Task as Task
Filter: ((("TaskName")::text ~~ 'Develop%'::text) AND (("TaskDescription")::text ~~ 'Use%'::text))
```

Вывод:

В ходе лабораторной работы были освоены практические навыки по созданию, запросов к базе данных в PostgreSQL с использованием инструмента управления pgAdmin4. Были созданы запросы на выборку, обновление, вставку и удаление, а также представления и индексы а также проанализировано их влияние на скорость выполнения запросов. Результаты показали что запросы с индексами работают быстрее, чем без них.