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«НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО»

Отчет

по лабораторной работе №3 «Запросы на выборку и модификацию данных, представления
и индексы в PostgreSQL»

по дисциплине «Проектирование и реализация баз данных»

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Цель работы

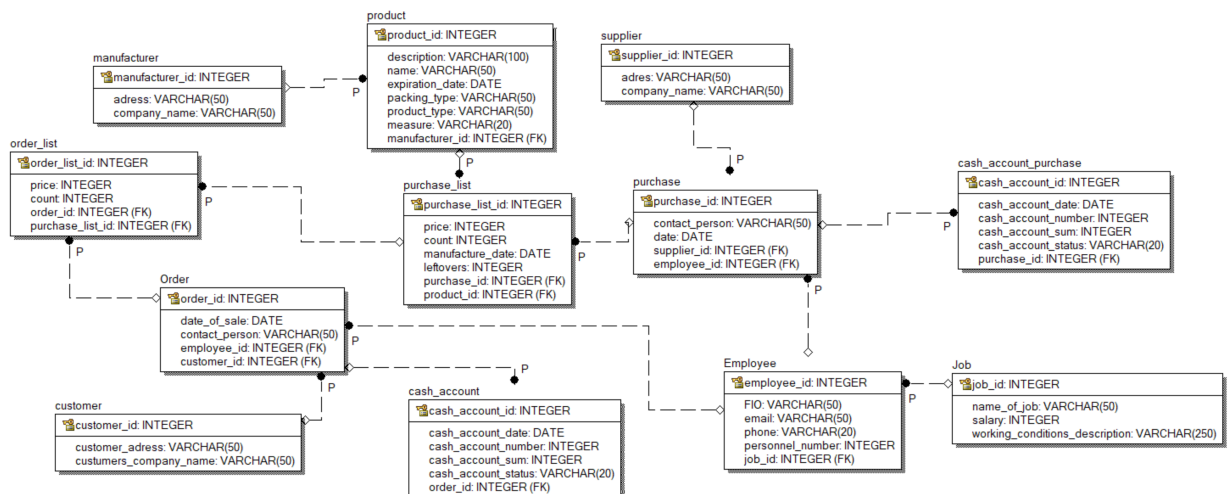
Овладеть практическими навыками создания таблиц базы данных PostgreSQL 1X, заполнения рабочими данными, резервного копирования и восстановления БД.

Практическое задание

1. Создать базу данных с использованием pgAdmin 4
2. Создать схему в составе базы данных.
3. Создать таблицы базы данных.
4. Установить ограничения на данные: Primary Key, Unique, Check, Foreign Key.
5. Заполнить таблицы БД рабочими данными.
6. Создать резервную копию БД
7. Восстановить БД

Вариант 9. БД «Оптовая база»

ERD БД:



Выполнение работы:

Для описания работы я использовал листинг из бекапа БД в формате plain

Создание схемы:

```
CREATE SCHEMA wholesale_base;
```

```
ALTER SCHEMA wholesale_base OWNER TO pg_database_owner;
```

Создание таблицы:

```
CREATE TABLE wholesale_base.cash_account (  
    cash_account_id integer NOT NULL,  
    date date NOT NULL,  
    number integer NOT NULL,  
    sum integer NOT NULL,  
    status character varying(20) NOT NULL,  
    order_id integer NOT NULL  
);
```

```
ALTER TABLE wholesale_base.cash_account OWNER TO pg_database_owner;
```

```
ALTER TABLE wholesale_base.cash_account ALTER COLUMN cash_account_id ADD GENERATED ALWAYS  
AS IDENTITY (  
    SEQUENCE NAME wholesale_base.cash_account_cash_account_id_seq  
    START WITH 1  
    INCREMENT BY 1  
    NO MINVALUE  
    NO MAXVALUE  
    CACHE 1  
);
```

```
CREATE TABLE wholesale_base.cash_account_purchase (  
    cash_account_purchase_id integer NOT NULL,  
    date date NOT NULL,  
    number integer NOT NULL,  
    sum integer NOT NULL,  
    status character varying(20) NOT NULL,  
    purchase_id integer NOT NULL  
);
```

```
ALTER TABLE wholesale_base.cash_account_purchase OWNER TO pg_database_owner;
```

```

ALTER TABLE wholesale_base.cash_account_purchase ALTER COLUMN cash_account_purchase_id ADD
GENERATED ALWAYS AS IDENTITY (

    SEQUENCE NAME wholesale_base.cash_account_purchase_cash_account_purchase_id_seq

    START WITH 1

    INCREMENT BY 1

    NO MINVALUE

    NO MAXVALUE

    CACHE 1

);

```

```

CREATE TABLE wholesale_base.customer (

    customer_id integer NOT NULL,

    customer_adress character varying(100) NOT NULL,

    customer_company_name character varying(50) NOT NULL

);

```

```

ALTER TABLE wholesale_base.customer OWNER TO pg_database_owner;

```

```

ALTER TABLE wholesale_base.customer ALTER COLUMN customer_id ADD GENERATED ALWAYS AS
IDENTITY (

    SEQUENCE NAME wholesale_base.customer_customer_id_seq

    START WITH 1

    INCREMENT BY 1

    NO MINVALUE

    NO MAXVALUE

    CACHE 1

);

```

```

CREATE TABLE wholesale_base.employee (

    employee_id integer NOT NULL,

    fio character varying(100) NOT NULL,

    email character varying(50),

    phone character varying(20),

```

```
personal_number integer NOT NULL,  
job_id integer NOT NULL  
);
```

```
ALTER TABLE wholesale_base.employee OWNER TO pg_database_owner;
```

```
ALTER TABLE wholesale_base.employee ALTER COLUMN employee_id ADD GENERATED ALWAYS AS  
IDENTITY (  
    SEQUENCE NAME wholesale_base.employee_employee_id_seq  
    START WITH 1  
    INCREMENT BY 1  
    NO MINVALUE  
    NO MAXVALUE  
    CACHE 1  
);
```

```
CREATE TABLE wholesale_base.job (  
    job_id integer NOT NULL,  
    name_of_job character varying(50) NOT NULL,  
    salary integer NOT NULL,  
    working_conditions_description character varying(250)  
);
```

```
ALTER TABLE wholesale_base.job OWNER TO pg_database_owner;
```

```
ALTER TABLE wholesale_base.job ALTER COLUMN job_id ADD GENERATED ALWAYS AS IDENTITY (  
    SEQUENCE NAME wholesale_base.job_job_id_seq  
    START WITH 1  
    INCREMENT BY 1  
    NO MINVALUE  
    NO MAXVALUE  
    CACHE 1
```

);

```
CREATE TABLE wholesale_base.manufacturer (  
    manufacturer_id integer NOT NULL,  
    adress character varying(50) NOT NULL,  
    company_name character varying(50) NOT NULL  
);
```

```
ALTER TABLE wholesale_base.manufacturer OWNER TO pg_database_owner;
```

```
ALTER TABLE wholesale_base.manufacturer ALTER COLUMN manufacturer_id ADD GENERATED ALWAYS  
AS IDENTITY (  
    SEQUENCE NAME wholesale_base.manufacturer_manufacturer_id_seq  
    START WITH 1  
    INCREMENT BY 1  
    NO MINVALUE  
    NO MAXVALUE  
    CACHE 1  
);
```

```
CREATE TABLE wholesale_base."order" (  
    order_id integer NOT NULL,  
    date_of_sale date NOT NULL,  
    contact_person character varying(50) NOT NULL,  
    employee_id integer NOT NULL,  
    customer_id integer NOT NULL  
);
```

```
ALTER TABLE wholesale_base."order" OWNER TO pg_database_owner;
```

```
CREATE TABLE wholesale_base.order_list (  
    order_list_id integer NOT NULL,
```

```
price integer NOT NULL,  
count integer NOT NULL,  
order_id integer NOT NULL,  
purchase_list_id integer NOT NULL  
);
```

```
ALTER TABLE wholesale_base.order_list OWNER TO pg_database_owner;
```

```
ALTER TABLE wholesale_base.order_list ALTER COLUMN order_list_id ADD GENERATED ALWAYS AS  
IDENTITY (  
    SEQUENCE NAME wholesale_base.order_list_order_list_id_seq  
    START WITH 1  
    INCREMENT BY 1  
    NO MINVALUE  
    NO MAXVALUE  
    CACHE 1  
);
```

```
ALTER TABLE wholesale_base."order" ALTER COLUMN order_id ADD GENERATED ALWAYS AS  
IDENTITY (  
    SEQUENCE NAME wholesale_base.order_order_id_seq  
    START WITH 1  
    INCREMENT BY 1  
    NO MINVALUE  
    NO MAXVALUE  
    CACHE 1  
);
```

```
CREATE TABLE wholesale_base.product (  
    product_id integer NOT NULL,  
    name character varying(50) NOT NULL,  
    expiration_date date NOT NULL,  
    packing_type character varying(50) NOT NULL,  
    product_type character varying(50) NOT NULL,
```



```
    manufacturer_id integer NOT NULL
);
```

```
ALTER TABLE wholesale_base.product OWNER TO pg_database_owner;
```

```
ALTER TABLE wholesale_base.product ALTER COLUMN product_id ADD GENERATED ALWAYS AS  
IDENTITY (
```

```
    SEQUENCE NAME wholesale_base.product_product_id_seq  
    START WITH 1  
    INCREMENT BY 1  
    NO MINVALUE  
    NO MAXVALUE  
    CACHE 1  
);
```

```
CREATE TABLE wholesale_base.purchase (
    purchase_id integer NOT NULL,
    contact_person character varying(50) NOT NULL,
    date date NOT NULL,
    supplier_id integer NOT NULL,
    employee_id integer NOT NULL
);
```

```
ALTER TABLE wholesale_base.purchase OWNER TO pg_database_owner;
```

```
CREATE TABLE wholesale_base.purchase_list (
    purchase_list_id integer NOT NULL,
    price integer NOT NULL,
    count integer NOT NULL,
    manufacture_date date NOT NULL,
    leftovers integer NOT NULL,
    purchase_id integer NOT NULL,
    product_id integer NOT NULL
);
```

```
ALTER TABLE wholesale_base.purchase_list OWNER TO pg_database_owner;
```

```
ALTER TABLE wholesale_base.purchase_list ALTER COLUMN purchase_list_id ADD GENERATED ALWAYS AS IDENTITY (
```

```
    SEQUENCE NAME wholesale_base.purchase_list_purchase_list_id_seq
```

```
    START WITH 1
```

```
    INCREMENT BY 1
```

```
    NO MINVALUE
```

```
    NO MAXVALUE
```

```
    CACHE 1
```

```
);
```

```
ALTER TABLE wholesale_base.purchase ALTER COLUMN purchase_id ADD GENERATED ALWAYS AS IDENTITY (
```

```
    SEQUENCE NAME wholesale_base.purchase_purchase_id_seq
```

```
    START WITH 1
```

```
    INCREMENT BY 1
```

```
    NO MINVALUE
```

```
    NO MAXVALUE
```

```
    CACHE 1
```

```
);
```

```
CREATE TABLE wholesale_base.supplier (
```

```
    supplier_id integer NOT NULL,
```

```
    adress character varying(50) NOT NULL,
```

```
    company_name character varying(50) NOT NULL
```

```
);
```

```
ALTER TABLE wholesale_base.supplier OWNER TO pg_database_owner;
```

```
ALTER TABLE wholesale_base.supplier ALTER COLUMN supplier_id ADD GENERATED ALWAYS AS IDENTITY (
```

```
    SEQUENCE NAME wholesale_base.supplier_supplier_id_seq
```

```

START WITH 1
INCREMENT BY 1
NO MINVALUE
NO MAXVALUE
CACHE 1
);

```

Создание ограничений:

```
ALTER TABLE wholesale_base.supplier
```

```

    ADD CONSTRAINT address_contains_english_letters_or_numbers_check CHECK
    (((address)::text ~* '^[A-Za-z0-9\s]+$'::text)) NOT VALID;

```

```
ALTER TABLE wholesale_base.manufacturer
```

```

    ADD CONSTRAINT address_latin_letters_numbers_spaces_check CHECK (((address)::text ~*
    '^[A-Za-z0-9._\s]+$'::text)) NOT VALID;

```

```
ALTER TABLE ONLY wholesale_base.cash_account
```

```

    ADD CONSTRAINT cash_account_pkey PRIMARY KEY (cash_account_id);

```

```
ALTER TABLE ONLY wholesale_base.cash_account_purchase
```

```

    ADD CONSTRAINT cash_account_purchase_pkey PRIMARY KEY
    (cash_account_purchase_id);

```

```
ALTER TABLE wholesale_base.manufacturer
```

```

    ADD CONSTRAINT company_name_latin_letters_numbers_spaces_check CHECK
    (((company_name)::text ~* '^[A-Za-z0-9_\s]+$'::text)) NOT VALID;

```

```
ALTER TABLE wholesale_base.supplier
```

```

    ADD CONSTRAINT company_name_letters_are_english_check CHECK
    (((company_name)::text ~* '^[A-Za-z0-9_\s]+$'::text)) NOT VALID;

```

```
ALTER TABLE wholesale_base."order"
```

```

    ADD CONSTRAINT contact_person_latin_letters_spaces_check CHECK
    (((contact_person)::text ~* '^[A-Za-z\s]+$'::text)) NOT VALID;

```

```
ALTER TABLE wholesale_base.purchase
```

```

ADD CONSTRAINT contact_person_latin_letters_spaces_check CHECK
(((contact_person)::text ~* '^[A-Za-z\s]+$'::text)) NOT VALID;

ALTER TABLE wholesale_base.customer

ADD CONSTRAINT customer_adress_latin_letters_numbers_spaces_check CHECK
(((customer_adress)::text ~* '^[A-Za-z0-9\s]+$'::text)) NOT VALID;

ALTER TABLE wholesale_base.customer

ADD CONSTRAINT customer_company_name_latin_letters_numbers_spaces_check
CHECK (((customer_company_name)::text ~* '^[A-Za-z0-9_\s]+$'::text)) NOT VALID;

ALTER TABLE ONLY wholesale_base.customer

ADD CONSTRAINT customer_pkey PRIMARY KEY (customer_id);

ALTER TABLE wholesale_base.employee

ADD CONSTRAINT email_validation CHECK (((email)::text ~* '^[a-zA-Z0-9._%+-]+@[a-
zA-Z0-9.-]+\.[a-zA-Z]{2,}$'::text)) NOT VALID;

ALTER TABLE ONLY wholesale_base.employee

ADD CONSTRAINT employee_pkey PRIMARY KEY (employee_id);

ALTER TABLE wholesale_base.employee

ADD CONSTRAINT fio_latin_letters_spaces_check CHECK (((fio)::text ~* '^[A-Za-z\s]+
$'::text)) NOT VALID;

ALTER TABLE ONLY wholesale_base.job

ADD CONSTRAINT job_pkey PRIMARY KEY (job_id);


ALTER TABLE wholesale_base.purchase_list

ADD CONSTRAINT leftovers_lower_or_equal_count CHECK ((leftovers <= count)) NOT
VALID;

ALTER TABLE ONLY wholesale_base.manufacturer

ADD CONSTRAINT manufacturer_pkey PRIMARY KEY (manufacturer_id);

ALTER TABLE wholesale_base.product

ADD CONSTRAINT name_latin_letters_numbers_spaces_check CHECK (((name)::text ~*
'^[A-Za-z0-9_\s]+$'::text)) NOT VALID;

```

ALTER TABLE wholesale_base.job

ADD CONSTRAINT name_of_job_latin_letters_spaces_check CHECK (((name_of_job)::text ~* '^[A-Za-z\s]+\$'::text)) NOT VALID;

ALTER TABLE ONLY wholesale_base.order_list

ADD CONSTRAINT order_list_pkey PRIMARY KEY (order_list_id);

ALTER TABLE ONLY wholesale_base."order"

ADD CONSTRAINT order_pkey PRIMARY KEY (order_id);

ALTER TABLE wholesale_base.product

ADD CONSTRAINT packing_type_choice_restriction CHECK (((packing_type)::text = ANY ((ARRAY['Block packaging'::character varying, 'Box packaging'::character varying, 'Pallet packaging'::character varying, 'Container packaging'::character varying, 'Bag packaging'::character varying])::text[]))) NOT VALID;

ALTER TABLE wholesale_base.employee

ADD CONSTRAINT phone_validation CHECK (((phone)::text ~ '^[0-9]{10}\$'::text)) NOT VALID;

ALTER TABLE wholesale_base.purchase_list

ADD CONSTRAINT positive_count_check CHECK ((count >= 0)) NOT VALID;

ALTER TABLE wholesale_base.order_list

ADD CONSTRAINT positive_count_check CHECK ((count >= 0)) NOT VALID;

ALTER TABLE wholesale_base.purchase_list

ADD CONSTRAINT positive_leftovers_check CHECK ((leftovers >= 0)) NOT VALID;

ALTER TABLE wholesale_base.cash_account

ADD CONSTRAINT positive_number_check CHECK ((number > 0)) NOT VALID;

ALTER TABLE wholesale_base.cash_account_purchase

ADD CONSTRAINT positive_number_check CHECK ((number > 0)) NOT VALID;

ALTER TABLE wholesale_base.employee

ADD CONSTRAINT positive_personal_number_check CHECK ((personal_number > 0)) NOT VALID;

ALTER TABLE wholesale_base.purchase_list

```

ADD CONSTRAINT positive_price_check CHECK ((price >= 0)) NOT VALID;

ALTER TABLE wholesale_base.order_list

ADD CONSTRAINT positive_price_check CHECK ((price >= 0)) NOT VALID;

ALTER TABLE wholesale_base.job

ADD CONSTRAINT positive_salary_check CHECK ((salary > 0)) NOT VALID;

ALTER TABLE wholesale_base.cash_account

ADD CONSTRAINT positive_sum_check CHECK ((sum > 0)) NOT VALID;

ALTER TABLE wholesale_base.cash_account_purchase

ADD CONSTRAINT positive_sum_check CHECK ((sum > 0)) NOT VALID;

ALTER TABLE ONLY wholesale_base.product

ADD CONSTRAINT product_pkey PRIMARY KEY (product_id);

ALTER TABLE wholesale_base.product

ADD CONSTRAINT product_type_choice_restriction CHECK (((product_type)::text = ANY
((ARRAY['Food and Beverages'::character varying, 'Industrial materials and
equipment'::character varying, 'Technical and electronic goods'::character varying, 'Clothing and
textiles'::character varying, 'Medical goods and equipment'::character varying, 'Construction
materials'::character varying, 'Automotive parts and accessories'::character varying, 'Stationery
supplies'::character varying]))::text[[]])) NOT VALID;

ALTER TABLE ONLY wholesale_base.purchase_list

ADD CONSTRAINT purchase_list_pkey PRIMARY KEY (purchase_list_id);

ALTER TABLE ONLY wholesale_base.purchase

ADD CONSTRAINT purchase_pkey PRIMARY KEY (purchase_id);

ALTER TABLE wholesale_base.cash_account

ADD CONSTRAINT status_choice_restriction CHECK (((status)::text = 'awaiting
payment'::text) OR ((status)::text = 'paid'::text) OR ((status)::text = 'rejected'::text))) NOT
VALID;

ALTER TABLE wholesale_base.cash_account_purchase

ADD CONSTRAINT status_choice_restriction CHECK (((status)::text = 'awaiting
payment'::text) OR ((status)::text = 'paid'::text) OR ((status)::text = 'rejected'::text))) NOT
VALID;

```

ALTER TABLE ONLY wholesale_base.supplier

ADD CONSTRAINT supplier_pkey PRIMARY KEY (supplier_id);

ALTER TABLE ONLY wholesale_base.employee

ADD CONSTRAINT unique_personal_number UNIQUE (personal_number) INCLUDE (personal_number);

CREATE TRIGGER check_if_leftovers_enough_before_insert BEFORE INSERT ON wholesale_base.order_list FOR EACH ROW EXECUTE FUNCTION wholesale_base.check_if_leftovers_enough();

CREATE TRIGGER subtract_count_from_leftovers AFTER INSERT ON wholesale_base.order_list FOR EACH ROW EXECUTE FUNCTION wholesale_base.subtract_from_leftovers();

ALTER TABLE ONLY wholesale_base."order"

ADD CONSTRAINT fk_customer FOREIGN KEY (customer_id) REFERENCES wholesale_base.customer(customer_id) NOT VALID;

ALTER TABLE ONLY wholesale_base."order"

ADD CONSTRAINT fk_employee FOREIGN KEY (employee_id) REFERENCES wholesale_base.employee(employee_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.purchase

ADD CONSTRAINT fk_employee FOREIGN KEY (employee_id) REFERENCES wholesale_base.employee(employee_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.employee

ADD CONSTRAINT fk_job FOREIGN KEY (job_id) REFERENCES wholesale_base.job(job_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.product

ADD CONSTRAINT fk_manufacturer FOREIGN KEY (manufacturer_id) REFERENCES wholesale_base.manufacturer(manufacturer_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.cash_account

ADD CONSTRAINT fk_order FOREIGN KEY (order_id) REFERENCES wholesale_base."order"(order_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.purchase_list

ADD CONSTRAINT fk_product FOREIGN KEY (product_id) REFERENCES
wholesale_base.product(product_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.purchase_list

ADD CONSTRAINT fk_purchase FOREIGN KEY (purchase_id) REFERENCES
wholesale_base.purchase(purchase_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.cash_account_purchase

ADD CONSTRAINT fk_purchase FOREIGN KEY (purchase_id) REFERENCES
wholesale_base.purchase(purchase_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.purchase

ADD CONSTRAINT fk_supplier FOREIGN KEY (supplier_id) REFERENCES
wholesale_base.supplier(supplier_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.order_list

ADD CONSTRAINT order_fkey FOREIGN KEY (order_id) REFERENCES
wholesale_base."order"(order_id) NOT VALID;

ALTER TABLE ONLY wholesale_base.order_list

ADD CONSTRAINT purchase_list_fkey FOREIGN KEY (purchase_list_id) REFERENCES
wholesale_base.purchase_list(purchase_list_id) NOT VALID;

	order_id [PK] integer 	date_of_sale date 	contact_person character varying (50) 	employee_id integer 	customer_id integer 
1	1	2023-04-25	Samantha Brown	19	15
2	2	2023-05-01	Chris Evans	20	16
3	3	2023-05-14	Jennifer Lee	21	1
4	4	2023-06-20	Kevin Johnson	22	2
5	5	2023-07-30	Melissa Smith	23	3
6	6	2023-08-05	Christopher Davis	24	4
7	7	2023-08-25	Jessica White	19	5
8	8	2023-09-15	Andrew Martin	20	6
9	9	2023-09-28	Stephanie Thompson	21	7
10	10	2024-10-05	Patrick Harris	22	8
11	11	2023-10-24	Nicole Clark	23	9
Total rows: 30 of 30			Query complete 00:00:00.054		

Заполнение рабочими данными:

Заполнение было бы слишком огромное по листику, так что прикрепляю фото простейшего select запроса

Создание бэкапа:

The image shows two overlapping dialog boxes from a database management application. The top dialog is titled "Backup (Database: wholesale_base)" and has tabs for "General", "Data Options", "Query Options", "Table Options", "Options", and "Objects". The "General" tab is active, showing fields for "Filename" (set to "/Users/dmitryfadeev/Desktop/wholesale_base_backup_v3.sql"), "Format" (set to "Custom"), "Compression ratio", "Encoding" (set to "Select an item..."), "Number of jobs", and "Role name" (set to "Select an item..."). At the bottom are buttons for "Close", "Reset", and "Backup".

The bottom dialog is titled "Restore (Database: wsb_backup)" and has tabs for "General", "Data Options", "Query Options", "Table Options", and "Options". The "General" tab is active, showing fields for "Format" (set to "Custom or tar"), "Filename" (set to "/Users/dmitryfadeev/Desktop/wholesale_base_backup_v2.sql"), "Number of jobs", and "Role name" (set to "Select an item..."). At the bottom are buttons for "Close", "Reset", and "Restore".

Восстановление БД:

Вывод:

В данной лабораторной работе выполнены различные запросы к базе данных «Банк», используя соединения таблиц, подзапросы и др. Были выполнены запросы на создание представлений, а также на модификацию данных: вставка, изменение и удаление. Были выполнены запросы без индекса и созданы планы запросов через EXPLAIN, далее были созданы различные индексы для различных запросов, но ни в одном из них не получилось их использовать, так как выполнение запроса без индекса вероятнее происходило быстрее из-за маленького количества данных в таблицах.