Министерство науки и высшего образования Российской Федерации

Федеральное государственное автономное образовательное учреждение высшего образования

«НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО»

Факультет инфокоммуникационных технологий

**ОТЧЕТ**

**О ЛАБОРАТОРНОЙ РАБОТЕ № 3**

по теме: Создание таблиц базы данных POSTGRESQL

по дисциплине: Проектирование и реализация баз данных

**Специальность**:

09.03.03 Мобильные и сетевые технологии

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| **Проверил**:  Говорова М.М. \_\_\_\_\_\_\_\_\_\_  **Дата**: «\_\_» \_\_\_\_ 2021 г.  Оценка \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | **Выполнил**:  студент группы K3240  Рейнгеверц В.А. |

Санкт-Петербург 2021 г.

**ЦЕЛЬ РАБОТЫ**

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

**ПРАКТИЧЕСКОЕ ЗАДАНИЕ**

Создать базу данных с использованием pgAdmin 4 (Вариант 4. БД «Учет выполнения заданий»).

1. Создать схему в составе базы данных.
2. Создать таблицы базы данных.
3. Установить ограничения на данные: *Primary Key, Unique, Check, Foreign Key*.
4. Заполнить таблицы БД рабочими данными.
5. Создать резервную копию БД.

*Указание:*

*Создать две резервные копии:*

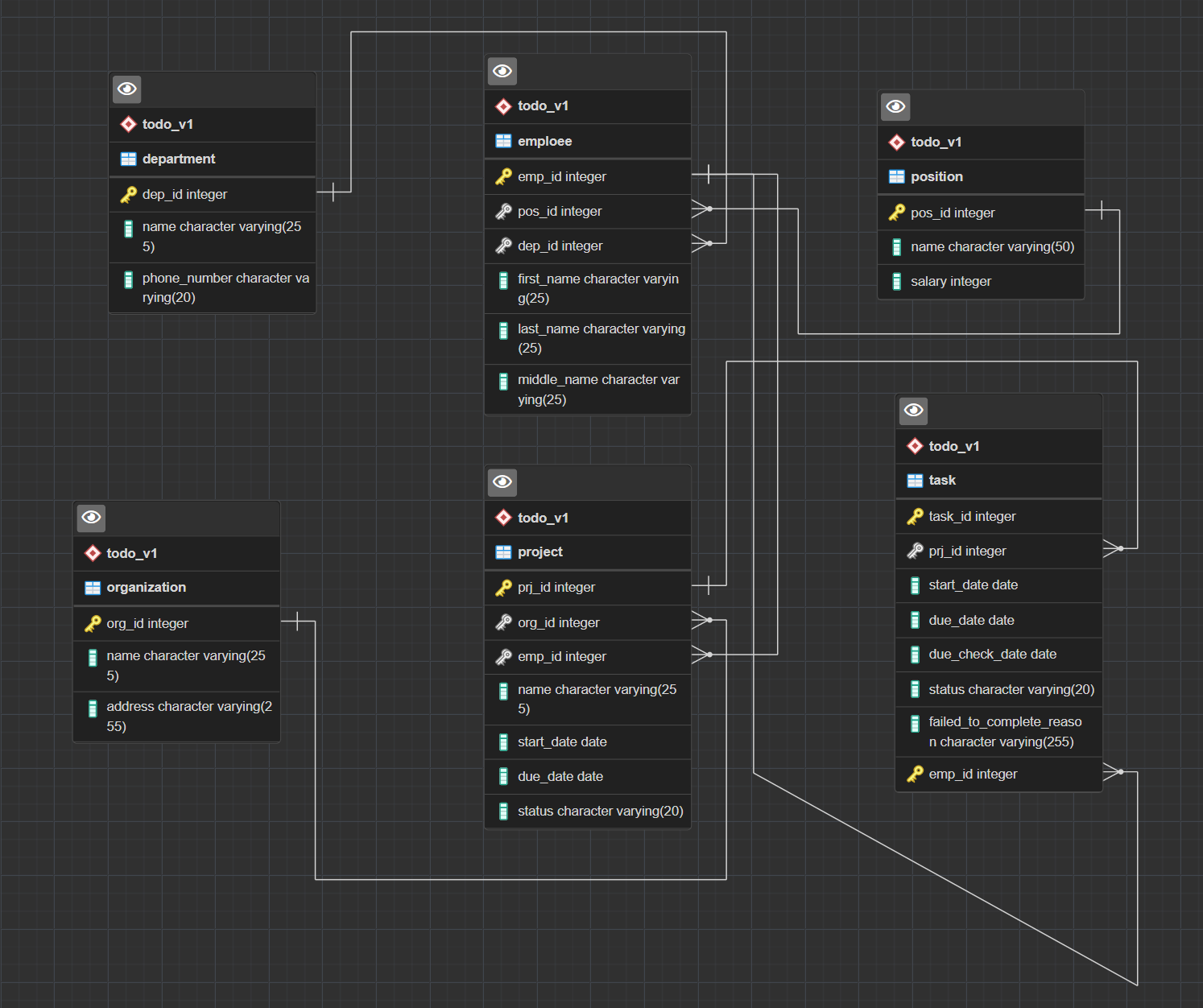
* *с расширением CUSTOM для восстановления БД;*
* *с расширением PLAIN для листинга (в отчете);*
* *при создании резервных копий БД настроить параметры Dump options для Type of objects**и**Queries .*

1. Восстановить БД.

**ВЫПОЛНЕНИЕ**

1. Наименование БД

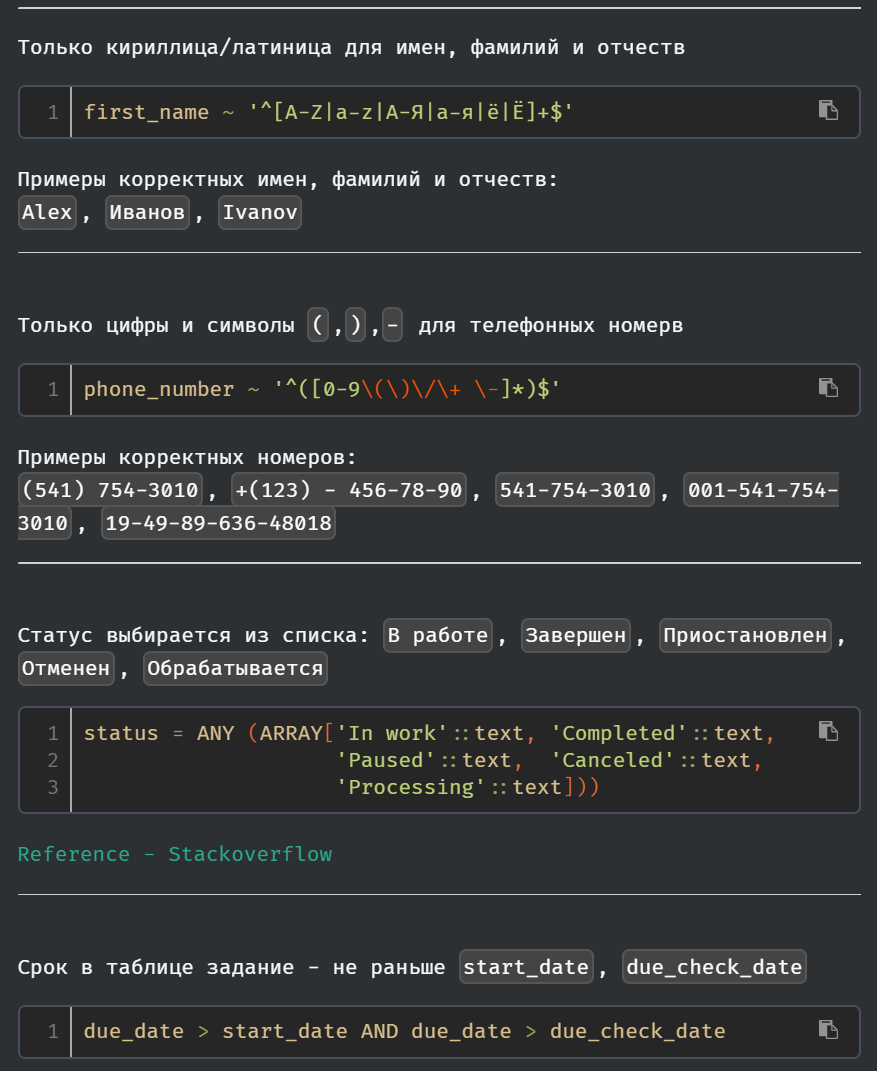
“todo\_app”

1. Схема логической модели базы данных, сгенерированная в Generate ERD

(рис. 1 - ER диаграмма)

1. Dump, содержащий скрипты работы с БД.

|  |
| --- |
| -- PostgreSQL database dump --  -- Dumped from database version 13.2 -- Dumped by pg\_dump version 13.2  -- Started on 2021-05-02 21:07:15  SET statement\_timeout = 0; SET lock\_timeout = 0; SET idle\_in\_transaction\_session\_timeout = 0; SET client\_encoding = 'UTF8'; SET standard\_conforming\_strings = on; SELECT pg\_catalog.set\_config('search\_path', '', false); SET check\_function\_bodies = false; SET xmloption = content; SET client\_min\_messages = warning; SET row\_security = off;  -- -- TOC entry 3039 (class 1262 OID 16396) -- Name: todo\_app; Type: DATABASE; Schema: -; Owner: postgres --  CREATE DATABASE todo\_app WITH TEMPLATE = template0 ENCODING = 'UTF8' LOCALE = 'Russian\_Russia.1251';   ALTER DATABASE todo\_app OWNER TO postgres;  \connect todo\_app  SET statement\_timeout = 0; SET lock\_timeout = 0; SET idle\_in\_transaction\_session\_timeout = 0; SET client\_encoding = 'UTF8'; SET standard\_conforming\_strings = on; SELECT pg\_catalog.set\_config('search\_path', '', false); SET check\_function\_bodies = false; SET xmloption = content; SET client\_min\_messages = warning; SET row\_security = off;  -- -- TOC entry 3040 (class 0 OID 0) -- Dependencies: 3039 -- Name: DATABASE todo\_app; Type: COMMENT; Schema: -; Owner: postgres --  COMMENT ON DATABASE todo\_app IS '2021.05.02 - db design - task 3';   -- -- TOC entry 6 (class 2615 OID 16397) -- Name: todo\_v1; Type: SCHEMA; Schema: -; Owner: postgres --  CREATE SCHEMA todo\_v1;   ALTER SCHEMA todo\_v1 OWNER TO postgres;  SET default\_tablespace = '';  SET default\_table\_access\_method = heap;  -- -- TOC entry 201 (class 1259 OID 16401) -- Name: department; Type: TABLE; Schema: todo\_v1; Owner: postgres --  CREATE TABLE todo\_v1.department (  dep\_id integer NOT NULL,  name character varying(255) NOT NULL,  phone\_number character varying(20) );   ALTER TABLE todo\_v1.department OWNER TO postgres;  -- -- TOC entry 203 (class 1259 OID 16414) -- Name: emploee; Type: TABLE; Schema: todo\_v1; Owner: postgres --  CREATE TABLE todo\_v1.emploee (  emp\_id integer NOT NULL,  pos\_id integer NOT NULL,  dep\_id integer NOT NULL,  first\_name character varying(25) NOT NULL,  last\_name character varying(25) NOT NULL,  middle\_name character varying(25) NOT NULL );   ALTER TABLE todo\_v1.emploee OWNER TO postgres;  -- -- TOC entry 204 (class 1259 OID 16434) -- Name: organization; Type: TABLE; Schema: todo\_v1; Owner: postgres --  CREATE TABLE todo\_v1.organization (  org\_id integer NOT NULL,  name character varying(255) NOT NULL,  address character varying(255) NOT NULL );   ALTER TABLE todo\_v1.organization OWNER TO postgres;  -- -- TOC entry 202 (class 1259 OID 16408) -- Name: position; Type: TABLE; Schema: todo\_v1; Owner: postgres --  CREATE TABLE todo\_v1."position" (  pos\_id integer NOT NULL,  name character varying(50) NOT NULL,  salary integer,  CONSTRAINT salary CHECK ((salary > 0)) );   ALTER TABLE todo\_v1."position" OWNER TO postgres;  -- -- TOC entry 3041 (class 0 OID 0) -- Dependencies: 202 -- Name: CONSTRAINT salary ON "position"; Type: COMMENT; Schema: todo\_v1; Owner: postgres --  COMMENT ON CONSTRAINT salary ON todo\_v1."position" IS 'Больше нуля';   -- -- TOC entry 205 (class 1259 OID 16442) -- Name: project; Type: TABLE; Schema: todo\_v1; Owner: postgres --  CREATE TABLE todo\_v1.project (  prj\_id integer NOT NULL,  org\_id integer NOT NULL,  emp\_id integer NOT NULL,  name character varying(255) NOT NULL,  start\_date date NOT NULL,  due\_date date NOT NULL,  status character varying(20) NOT NULL,  CONSTRAINT due\_date CHECK ((due\_date > start\_date)) );   ALTER TABLE todo\_v1.project OWNER TO postgres;  -- -- TOC entry 3042 (class 0 OID 0) -- Dependencies: 205 -- Name: CONSTRAINT due\_date ON project; Type: COMMENT; Schema: todo\_v1; Owner: postgres --  COMMENT ON CONSTRAINT due\_date ON todo\_v1.project IS 'Не раньше start\_date';   -- -- TOC entry 206 (class 1259 OID 16458) -- Name: task; Type: TABLE; Schema: todo\_v1; Owner: postgres --  CREATE TABLE todo\_v1.task (  task\_id integer NOT NULL,  prj\_id integer NOT NULL,  start\_date date,  due\_date date,  due\_check\_date date,  status character varying(20) NOT NULL,  failed\_to\_complete\_reason character varying(255),  emp\_id integer NOT NULL );   ALTER TABLE todo\_v1.task OWNER TO postgres;  -- -- TOC entry 3028 (class 0 OID 16401) -- Dependencies: 201 -- Data for Name: department; Type: TABLE DATA; Schema: todo\_v1; Owner: postgres --  INSERT INTO todo\_v1.department (dep\_id, name, phone\_number) VALUES (1, 'Department of Science', '(541) 754-3010'); INSERT INTO todo\_v1.department (dep\_id, name, phone\_number) VALUES (2, 'Department of Future', '+(123) - 456-78-90');   -- -- TOC entry 3030 (class 0 OID 16414) -- Dependencies: 203 -- Data for Name: emploee; Type: TABLE DATA; Schema: todo\_v1; Owner: postgres --  INSERT INTO todo\_v1.emploee (emp\_id, pos\_id, dep\_id, first\_name, last\_name, middle\_name) VALUES (1, 1, 1, 'Vlad', 'Dracula', 'Nightmare'); INSERT INTO todo\_v1.emploee (emp\_id, pos\_id, dep\_id, first\_name, last\_name, middle\_name) VALUES (2, 2, 1, 'Karen', 'Smith', 'Middle'); INSERT INTO todo\_v1.emploee (emp\_id, pos\_id, dep\_id, first\_name, last\_name, middle\_name) VALUES (3, 2, 2, 'Karen', 'The', 'Second'); INSERT INTO todo\_v1.emploee (emp\_id, pos\_id, dep\_id, first\_name, last\_name, middle\_name) VALUES (4, 3, 1, 'Ivan', 'Ivanov', 'Ivanovich'); INSERT INTO todo\_v1.emploee (emp\_id, pos\_id, dep\_id, first\_name, last\_name, middle\_name) VALUES (5, 3, 1, 'Peter', 'Petrov', 'Petrovich'); INSERT INTO todo\_v1.emploee (emp\_id, pos\_id, dep\_id, first\_name, last\_name, middle\_name) VALUES (6, 3, 2, 'Oleg', 'Olegov', 'Olegovich'); INSERT INTO todo\_v1.emploee (emp\_id, pos\_id, dep\_id, first\_name, last\_name, middle\_name) VALUES (7, 3, 2, 'Andrew', 'Androv', 'Andrevich');   -- -- TOC entry 3031 (class 0 OID 16434) -- Dependencies: 204 -- Data for Name: organization; Type: TABLE DATA; Schema: todo\_v1; Owner: postgres --  INSERT INTO todo\_v1.organization (org\_id, name, address) VALUES (1, 'OOO "Gosudarstvo"', 'Ulitsa Pushkina, dom Kolotushkina'); INSERT INTO todo\_v1.organization (org\_id, name, address) VALUES (2, '"SpaceX"', 'Solar System, Mars');   -- -- TOC entry 3029 (class 0 OID 16408) -- Dependencies: 202 -- Data for Name: position; Type: TABLE DATA; Schema: todo\_v1; Owner: postgres --  INSERT INTO todo\_v1."position" (pos\_id, name, salary) VALUES (2, 'Manager', 100000); INSERT INTO todo\_v1."position" (pos\_id, name, salary) VALUES (1, 'CEO', 500000); INSERT INTO todo\_v1."position" (pos\_id, name, salary) VALUES (3, 'Worker', 50000);   -- -- TOC entry 3032 (class 0 OID 16442) -- Dependencies: 205 -- Data for Name: project; Type: TABLE DATA; Schema: todo\_v1; Owner: postgres --  INSERT INTO todo\_v1.project (prj\_id, org\_id, emp\_id, name, start\_date, due\_date, status) VALUES (1, 1, 2, 'Science Adv', '2021-05-02', '2021-05-10', 'In work'); INSERT INTO todo\_v1.project (prj\_id, org\_id, emp\_id, name, start\_date, due\_date, status) VALUES (2, 2, 3, 'Time machine', '2021-05-03', '2021-05-20', 'In work');   -- -- TOC entry 3033 (class 0 OID 16458) -- Dependencies: 206 -- Data for Name: task; Type: TABLE DATA; Schema: todo\_v1; Owner: postgres --  INSERT INTO todo\_v1.task (task\_id, prj\_id, start\_date, due\_date, due\_check\_date, status, failed\_to\_complete\_reason, emp\_id) VALUES (1, 1, '2021-05-02', '2021-05-10', '2021-05-05', 'Completed', NULL, 4); INSERT INTO todo\_v1.task (task\_id, prj\_id, start\_date, due\_date, due\_check\_date, status, failed\_to\_complete\_reason, emp\_id) VALUES (2, 1, '2021-05-02', '2021-05-10', '2021-05-05', 'Canceled', NULL, 5); INSERT INTO todo\_v1.task (task\_id, prj\_id, start\_date, due\_date, due\_check\_date, status, failed\_to\_complete\_reason, emp\_id) VALUES (3, 2, '2021-05-02', '2021-05-20', '2021-05-10', 'Paused', NULL, 6); INSERT INTO todo\_v1.task (task\_id, prj\_id, start\_date, due\_date, due\_check\_date, status, failed\_to\_complete\_reason, emp\_id) VALUES (4, 2, '2021-05-02', '2021-05-20', '2021-05-10', 'In work', NULL, 7); INSERT INTO todo\_v1.task (task\_id, prj\_id, start\_date, due\_date, due\_check\_date, status, failed\_to\_complete\_reason, emp\_id) VALUES (5, 1, '2021-05-02', '2021-05-20', '2021-05-10', 'Canceled', 'Karen doesnt want to work', 2); INSERT INTO todo\_v1.task (task\_id, prj\_id, start\_date, due\_date, due\_check\_date, status, failed\_to\_complete\_reason, emp\_id) VALUES (6, 2, '2021-05-02', '2021-05-20', '2021-05-10', 'Processing', NULL, 1);   -- -- TOC entry 2881 (class 2606 OID 16406) -- Name: department department\_pkey; Type: CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.department  ADD CONSTRAINT department\_pkey PRIMARY KEY (dep\_id);   -- -- TOC entry 2877 (class 2606 OID 16474) -- Name: task due\_check\_date; Type: CHECK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE todo\_v1.task  ADD CONSTRAINT due\_check\_date CHECK (((due\_check\_date > start\_date) AND (due\_check\_date < due\_date))) NOT VALID;   -- -- TOC entry 2878 (class 2606 OID 16473) -- Name: task due\_date; Type: CHECK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE todo\_v1.task  ADD CONSTRAINT due\_date CHECK (((due\_date > start\_date) AND (due\_date > due\_check\_date))) NOT VALID;   -- -- TOC entry 3043 (class 0 OID 0) -- Dependencies: 2878 -- Name: CONSTRAINT due\_date ON task; Type: COMMENT; Schema: todo\_v1; Owner: postgres --  COMMENT ON CONSTRAINT due\_date ON todo\_v1.task IS 'Не раньше start\_date, due\_check\_date';   -- -- TOC entry 2885 (class 2606 OID 16419) -- Name: emploee emploee\_pkey; Type: CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.emploee  ADD CONSTRAINT emploee\_pkey PRIMARY KEY (emp\_id);   -- -- TOC entry 2872 (class 2606 OID 16510) -- Name: emploee first\_name; Type: CHECK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE todo\_v1.emploee  ADD CONSTRAINT first\_name CHECK (((first\_name)::text ~ '^[A-Z|a-z|А-Я|а-я|ё|Ё]+$'::text)) NOT VALID;   -- -- TOC entry 2873 (class 2606 OID 16512) -- Name: emploee last\_name; Type: CHECK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE todo\_v1.emploee  ADD CONSTRAINT last\_name CHECK (((last\_name)::text ~ '^[A-Z|a-z|А-Я|а-я|ё|Ё]+$'::text)) NOT VALID;   -- -- TOC entry 2874 (class 2606 OID 16511) -- Name: emploee middle\_name; Type: CHECK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE todo\_v1.emploee  ADD CONSTRAINT middle\_name CHECK (((middle\_name)::text ~ '^[A-Z|a-z|А-Я|а-я|ё|Ё]+$'::text)) NOT VALID;   -- -- TOC entry 2887 (class 2606 OID 16441) -- Name: organization organization\_pkey; Type: CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.organization  ADD CONSTRAINT organization\_pkey PRIMARY KEY (org\_id);   -- -- TOC entry 2870 (class 2606 OID 16490) -- Name: department phone\_number; Type: CHECK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE todo\_v1.department  ADD CONSTRAINT phone\_number CHECK (((phone\_number)::text ~ '^([0-9\(\)\/\+ \-]\*)$'::text)) NOT VALID;   -- -- TOC entry 2883 (class 2606 OID 16413) -- Name: position position\_pkey; Type: CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1."position"  ADD CONSTRAINT position\_pkey PRIMARY KEY (pos\_id);   -- -- TOC entry 2889 (class 2606 OID 16447) -- Name: project project\_pkey; Type: CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.project  ADD CONSTRAINT project\_pkey PRIMARY KEY (prj\_id);   -- -- TOC entry 2879 (class 2606 OID 16513) -- Name: task status; Type: CHECK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE todo\_v1.task  ADD CONSTRAINT status CHECK (((status)::text = ANY (ARRAY['In work'::text, 'Completed'::text, 'Paused'::text, 'Canceled'::text, 'Processing'::text]))) NOT VALID;   -- -- TOC entry 2876 (class 2606 OID 16514) -- Name: project status; Type: CHECK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE todo\_v1.project  ADD CONSTRAINT status CHECK (((status)::text = ANY (ARRAY['In work'::text, 'Completed'::text, 'Paused'::text, 'Canceled'::text, 'Processing'::text]))) NOT VALID;   -- -- TOC entry 2891 (class 2606 OID 16462) -- Name: task task\_pkey; Type: CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.task  ADD CONSTRAINT task\_pkey PRIMARY KEY (task\_id, emp\_id);   -- -- TOC entry 2893 (class 2606 OID 16425) -- Name: emploee dep\_id\_fk; Type: FK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.emploee  ADD CONSTRAINT dep\_id\_fk FOREIGN KEY (dep\_id) REFERENCES todo\_v1.department(dep\_id);   -- -- TOC entry 2895 (class 2606 OID 16453) -- Name: project emp\_id\_fk; Type: FK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.project  ADD CONSTRAINT emp\_id\_fk FOREIGN KEY (emp\_id) REFERENCES todo\_v1.emploee(emp\_id);   -- -- TOC entry 2897 (class 2606 OID 16468) -- Name: task emp\_id\_fk; Type: FK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.task  ADD CONSTRAINT emp\_id\_fk FOREIGN KEY (emp\_id) REFERENCES todo\_v1.emploee(emp\_id);   -- -- TOC entry 2894 (class 2606 OID 16448) -- Name: project org\_id\_fk; Type: FK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.project  ADD CONSTRAINT org\_id\_fk FOREIGN KEY (org\_id) REFERENCES todo\_v1.organization(org\_id);   -- -- TOC entry 2892 (class 2606 OID 16420) -- Name: emploee pos\_id\_fk; Type: FK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.emploee  ADD CONSTRAINT pos\_id\_fk FOREIGN KEY (pos\_id) REFERENCES todo\_v1."position"(pos\_id);   -- -- TOC entry 2896 (class 2606 OID 16463) -- Name: task prj\_id\_fk; Type: FK CONSTRAINT; Schema: todo\_v1; Owner: postgres --  ALTER TABLE ONLY todo\_v1.task  ADD CONSTRAINT prj\_id\_fk FOREIGN KEY (prj\_id) REFERENCES todo\_v1.project(prj\_id);   -- Completed on 2021-05-02 21:07:15  -- -- PostgreSQL database dump complete -- |

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(рис. 1 - Комментарий к ограничениям)

**ВЫВОДЫ**

Программа pgAdmin позволяет создавать базы данных на высоком уровне: либо напрямую посредством взаимодействия с ее GUI, или же через работу на встроенном генераторе ER диаграмм. Однако, каким способом диаграмма не была создана, всегда сохраняется возможность увидеть какими SQL командами была создана диаграмма. Видеть код, создаваемый нажатием кнопки в интерфейсе, оказалось полезным для нахождения ошибок и общего понимания работы программы.