

Московский Авиационный Институт
(Национальный Исследовательский Университет)
Институт информационных технологий и прикладной математики
Кафедра вычислительной математики и программирования

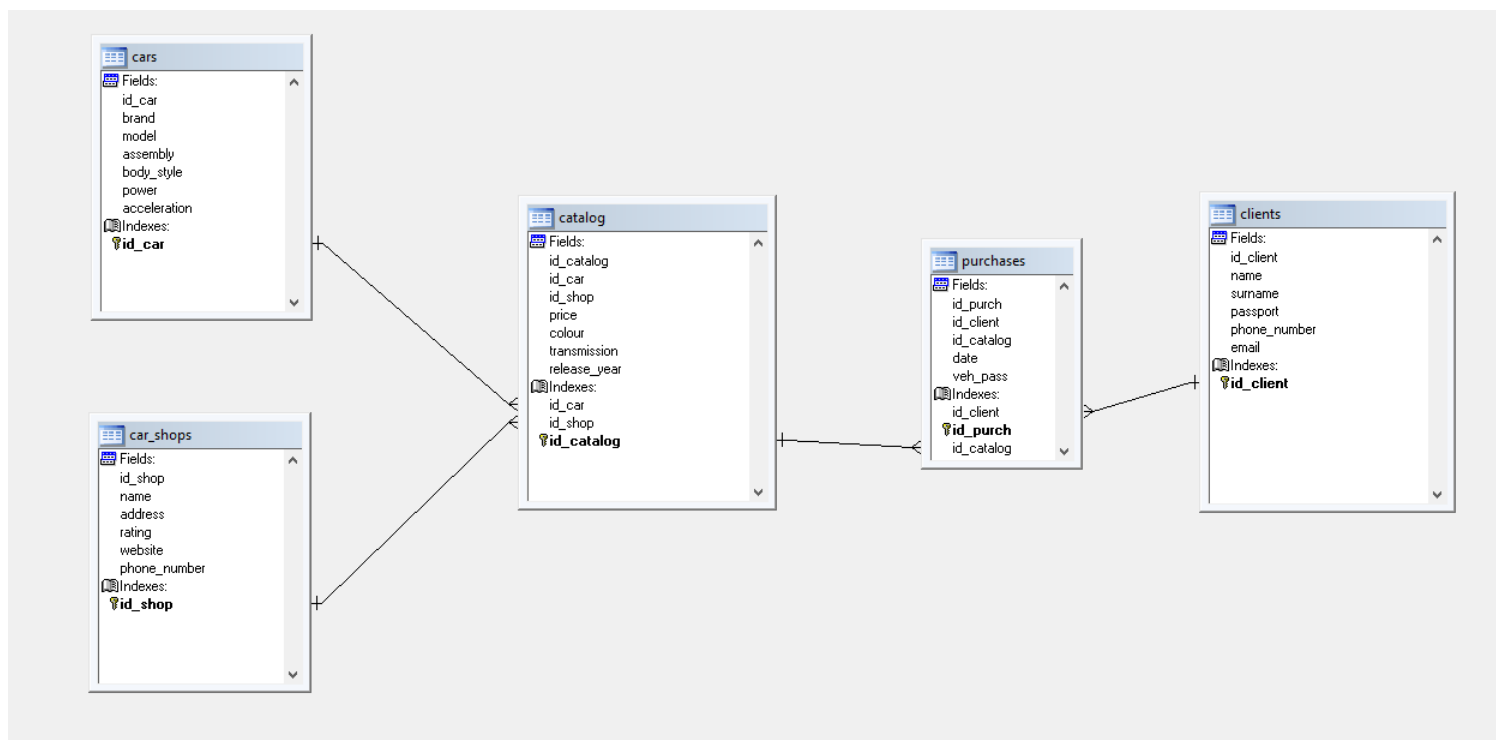
Лабораторная работа по курсу
«Базы данных»

Тема: Каталог автомобилей

Выполнили: Моисеенков И. П.,
Шавандрин Ф. М.
Группа: М8О – 308Б-19
Преподаватель: Киндинова В. В.
Дата: _____
Оценка: _____
Подпись: _____

Москва, 2021

База данных в FoxPro



Таблицы:

Cars (автомобили):

Id_car	Brand	Model	Assembly	Body_style	Power	Acceleration
1	Mercedes	GLA	Germany	off-road	306	5.2
2	BMW	x5	Germany	off-road	231	5.5
3	Lada	Granta	Russia	sedan	106	12.0
4	Lamborghini	Aventador	Italy	sportcar	740	2.9
5	UAZ	Patriot	Russia	off-road	150	20.0
6	Lada	Ok	Russia	hatchback	33	30.0
7	Toyota	Camri	Japan	sedan	150	9.5
8	Dodge	Challenger	USA	coupe	305	10.0
9	Renault	Logan	France	sedan	102	12.0
10	Gazelle	Next	Russia	minibus	107	21.0

- id_car – идентификатор автомобиля (integer)
- brand – марка автомобиля (character)
- model – модель автомобиля (character)
- assembly – производитель автомобиля (character)
- body_style – тип кузова (character)
- power – мощность, л.с. (integer)
- acceleration – разгон до 100 км/ч, с (double)

Car_shops (автосалоны):

Id_shop	Name	Address	Rating	Website	Phone_number
1	Avtogermes	Sormovskaya st, 21A	4.4	avtogermes.ru	+74951360100
2	Techinkom	Kulakova st, 24	4.4	pro-lada.ru	+74951534302
3	Autoretail	Baykalskaya st, 5	3.9	autoretail.ru	+74957831313
4	Rolf	Yakimanka st, 26	4.5	rolf.bmw-yakimanka	+74952923731
5	Favorit Motors	Kotpevskaya st, 69A	4.5	renault-favorit.ru	+74953240984
6	Panavto	Torgovaya st, 4	5.0	mercedes-panavto.ru	+74957907777
7	Toyota center city	Magistralnaya st, 13	4.4	major-toyota.ru	+74951536018
8	Kuntsevo	Gorbynova st, 14	4.2	sale.uz-kuntsevo.ru	+74953208426
9	Avtomir	Stavropolskaya st, 41	4.5	ford-avtomir.ru	+74951537745
10	Avtodom	Kytyzovskaya st, 12A	4.3	lamborghini-avtodom	+74951864748

- id_shop – идентификатор автосалона (integer)
- name – название автосалона (character)
- address – адрес (character)
- rating – рейтинг (double)
- website – веб-сайт (character)
- phone_number – номер телефона (character)

Catalog (каталог):

Id_catalog	Id_car	Id_shop	Price	Colour	Transmission	Release_year
1	3	1	480000	Pink	Mechanical	2020
2	5	1	1170000	Yellow	Automatic	2018
3	3	2	500000	Black	Robot	2021
4	5	2	1300000	Black	Automatic	2019
5	5	8	1250000	Blue	Automatic	2020
6	10	3	1900000	White	Automatic	2019
7	7	7	1700000	Green	Automatic	2020
8	9	5	730000	Grey	Mechanical	2017
9	9	5	870000	Red	Automatic	2020
10	2	4	6000000	Black	Automatic	2021
11	1	6	3100000	Orange	Automatic	2018
12	1	6	3100000	Lime	Automatic	2019
13	4	10	16000000	Yellow	Automatic	2016
14	7	7	1690000	Black	Automatic	2020
15	10	3	1862000	Blue	Automatic	2018

- id_catalog – идентификатор позиции в каталоге (integer)
- id_car – идентификатор автомобиля (integer)
- id_shop – идентификатор автосалона (integer)
- price – цена (integer)
- colour – цвет (character)
- transmission – тип трансмиссии (character)
- release_year – год выпуска (integer)

Clients (клиенты):

Id_client	Name	Surname	Passport	Phone_number	Email
1	Nikita	Makarov	4522814890	+79771337228	nkmakarov@yandex.ru
2	Abdul	Abdulov	1231234560	+99854991840	abdulobdul@boom.ru
3	Barack	Obama	5448943489	+18798786456	blackmonkey@gmail.com
4	Anton	Petyhov	9456489465	+79600450840	antonpetyh@mail.ru
5	Gaupt	Vakhtov	4545641659	+75640896030	superemoboy@rambler.ru
6	Elena	Ivanova	8454894685	+74084600560	ilovematan@mail.ru
7	Georgiy	Izmaylov	7465436434	+70340840880	oldmamont@stone.ru
8	Alexander	Semenov	7998646849	+75464894449	mayamibeach@la.us
9	Sergey	Sperminoff	4564894868	+75465045066	meowmeowgavgav@gmail.com
10	Anfisa	Pushkina	8498464846	+38089465486	verybig@ham.ru

- id_client – идентификатор клиента (integer)
- name – имя (character)
- surname – фамилия (character)
- passport – номер паспорта (character)
- phone_number – номер телефона (character)
- email – адрес электронной почты (character)

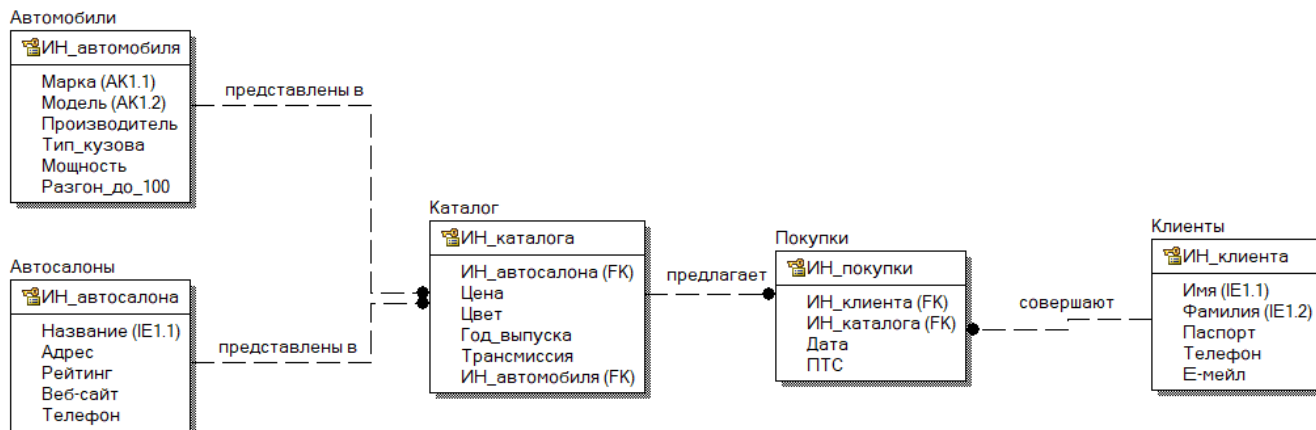
Purchases (покупки):

Id_purch	Id_client	Id_catalog	Date	Veh_pass
1	5	8	10/13/21	14MX122132
2	4	1	12/07/20	10KA819237
3	10	8	09/11/21	12MB849486
4	1	9	05/18/20	13KT879466
5	3	2	01/08/20	84BE965556
6	8	14	02/09/19	68HX122331
7	2	5	06/01/20	73HO982312
8	3	13	08/28/21	86HO123212
9	10	10	06/24/21	32MT983412
10	7	8	01/08/21	12EA897981
11	9	15	02/14/20	24MO123111
12	7	7	07/07/20	77AA777778

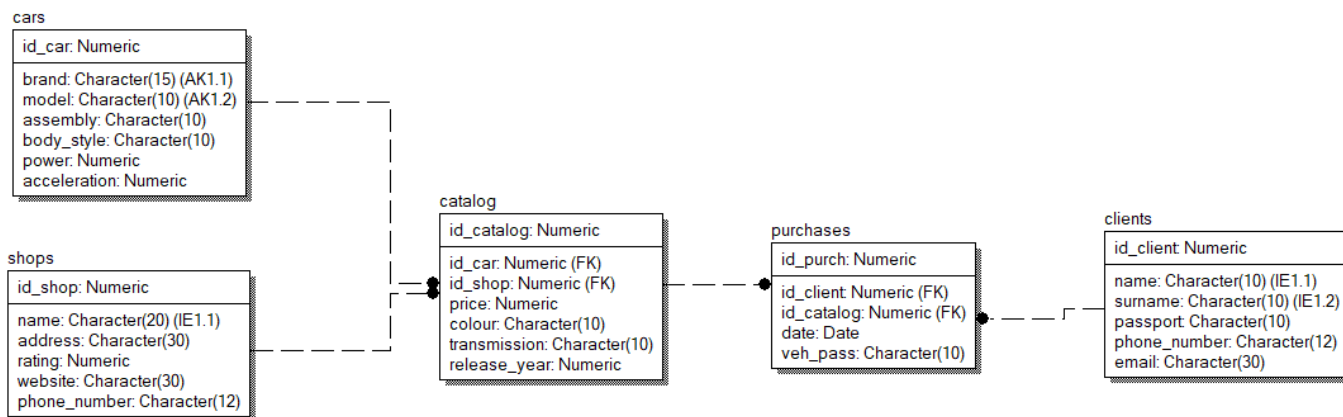
- id_purch – идентификатор покупки (integer)
- id_client – идентификатор клиента (integer)
- id_catalog – идентификатор позиции в каталоге (integer)
- date – дата покупки (date)
- veh_pass – номер ПТС (character)

База данных в Erwin

Логическая модель:



Физическая модель:



Код для генерации БД:

```

CREATE TABLE cars
(
    id_car          Numeric NOT NULL,
    brand           Character(15) NULL,
    model           Character(10) NULL,
    assembly        Character(10) NULL,
    body_style      Character(10) NULL,
    power           Numeric NOT NULL,
    acceleration     Numeric NOT NULL
);

CREATE UNIQUE INDEX XPKCars ON cars
(
    id_car          ASC
);

CREATE UNIQUE INDEX XAK1Cars ON cars
(
    brand           ASC,
    model           ASC
);
    
```

```
);
```

```
CREATE TABLE catalog
```

```
(  
    id_catalog      Numeric NOT NULL,  
    id_car           Numeric NOT NULL,  
    id_shop          Numeric NOT NULL,  
    price            Numeric NOT NULL,  
    colour           Character(10) NULL,  
    release_year     Numeric NOT NULL,  
    transmission     Character(10) NULL  
);
```

```
CREATE UNIQUE INDEX XPKCatalog ON catalog
```

```
(  
    id_catalog      ASC  
);
```

```
CREATE TABLE clients
```

```
(  
    id_client        Numeric NOT NULL,  
    name             Character(10) NULL,  
    surname           Character(10) NULL,  
    passport          Character(10) NULL,  
    phone_number      Character(12) NULL,  
    email             Character(30) NULL  
);
```

```
CREATE UNIQUE INDEX XPKClients ON clients
```

```
(  
    id_client        ASC  
);
```

```
CREATE TABLE purchases
```

```
(  
    id_purch         Numeric NOT NULL,  
    date             Date NULL,  
    veh_pass          Character(10) NULL,  
    id_client         Numeric NOT NULL,  
    id_catalog        Numeric NOT NULL  
);
```

```
CREATE UNIQUE INDEX XPKPurchases ON purchases
```

```
(  
    id_purch         ASC  
);
```

```
CREATE TABLE shops
```

```
(  
    id_shop          Numeric NOT NULL,
```

```

        name                Character(20) NULL,
        address              Character(30) NULL,
        rating               Numeric NOT NULL,
        website              Character(30) NULL,
        phone_number         Character(12) NULL
    );

```

```

CREATE UNIQUE INDEX XPKShops ON shops
(
    id_shop                ASC
);

```

Запросы к базе данных

1. Пары российских моделей одного салона.

```

SELECT;
    cat1.id_car AS id_car1, cars1.brand AS brand1, cars1.model AS model1,;
    cat2.id_car AS id_car2, cars2.brand AS brand2, cars2.model AS model2,;
    car_shops.name AS car_shop;
FROM;
    catalog AS cat1, catalog AS cat2, car_shops,;
    cars AS cars1, cars AS cars2;
WHERE;
    cat1.id_shop = cat2.id_shop AND cat1.id_car < cat2.id_car;
    AND cars1.assembly = 'Russia' AND cars2.assembly = 'Russia';
    AND cat1.id_shop = cat2.id_shop AND cat1.id_shop = car_shops.id_shop;
    AND cars1.id_car = cat1.id_car AND cars2.id_car = cat2.id_car

```

Id_car1	Brand1	Model1	Id_car2	Brand2	Model2	Car_shop
3	Lada	Granta	5	UAZ	Patriot	Avtogermes
3	Lada	Granta	5	UAZ	Patriot	Techinkom

2. Покупатели, не обращавшиеся в заданный салон.

```

SELECT;
    clients.id_client, clients.name, clients.surname;
FROM clients;
WHERE clients.id_client NOT IN (
    SELECT purchases.id_client;
    FROM purchases, catalog;
    WHERE;
        catalog.id_catalog = purchases.id_catalog;
        AND catalog.id_shop = (
            SELECT id_shop FROM car_shops WHERE name = 'Rolf';
        );
    )

```

Id_client	Name	Surname
1	Nikita	Makarov
2	Abdul	Abdulov
3	Barack	Obama
4	Anton	Petyhov
5	Gaapt	Vakhtov
6	Elena	Ivanova
7	Georgiy	Izmaylov
8	Alexander	Semenov
9	Sergey	Sperminoff

3. Наиболее популярные салоны (покупателей выше среднего)

```
SELECT catalog.id_shop, COUNT(purchases.id_client) AS clients_num;
FROM catalog, purchases;
WHERE purchases.id_catalog = catalog.id_catalog;
GROUP BY catalog.id_shop INTO CURSOR c1
```

```
SELECT c1.id_shop, car_shops.name;
FROM c1, car_shops;
WHERE c1.clients_num > (SELECT AVG(c1.clients_num) FROM c1);
      AND c1.id_shop = car_shops.id_shop
```

Id_shop	Name
1	Avtogermes
5	Favorit Motors
7	Toyota center city

4. Покупатель, затративший на приобретение машин (одной или нескольких) максимальную совокупную сумму.

```
SELECT purchases.id_client, SUM(catalog.price) AS total_spent;
FROM catalog, purchases;
WHERE purchases.id_catalog = catalog.id_catalog;
GROUP BY purchases.id_client INTO CURSOR c2
```

```
SELECT c2.id_client, clients.name, clients.surname;
FROM c2, clients;
WHERE total_spent = (SELECT MAX(total_spent) FROM c2);
      AND c2.id_client = clients.id_client
```

Id_client	Name	Surname
3	Barack	Obama

5. Люди, совершившие хотя бы одну покупку (запрос с предикатом на подзапросе со словом Exists).

```
SELECT clients.id_client, clients.name, clients.surname;
FROM clients;
WHERE EXISTS (
      SELECT *;
      FROM purchases;
      WHERE purchases.id_client = clients.id_client;
    )
```

Id_client	Name	Surname
1	Nikita	Makarov
2	Abdul	Abdulov
3	Barack	Obama
4	Anton	Petyhov
5	Gaupt	Vakhtov
7	Georgiy	Izmaylov
8	Alexander	Semenov
9	Sergey	Sperminoff
10	Anfisa	Pushkina

6. Салон, в котором представлено максимальное количество немецких моделей года выпуска не ранее заданного.

```
SELECT catalog.id_shop, COUNT(catalog.id_car) AS num_cars;
FROM catalog, car_shops;
WHERE;
    catalog.id_car = cars.id_car;
    AND cars.assembly = 'Germany';
    AND catalog.release_year >= 2018;
GROUP BY catalog.id_shop;
INTO CURSOR c3
```

```
SELECT c3.id_shop, car_shops.name;
FROM c3, car_shops;
WHERE car_shops.id_shop = c3.id_shop;
    AND c3.num_cars = (SELECT MAX(num_cars) FROM c3)
```

Id_shop	Name
6	Panavto

7. Наиболее популярный цвет авто на заданном интервале дат.

```
SELECT catalog.colour, COUNT(purchases.id_catalog) AS num_cars;
FROM catalog, purchases;
WHERE;
    purchases.id_catalog = catalog.id_catalog;
    AND purchases.date BETWEEN CTOD("01/01/2020") AND CTOD("12/31/2020");
GROUP BY catalog.colour;
INTO CURSOR c4
```

```
SELECT colour;
FROM c4;
WHERE num_cars = (SELECT MAX(num_cars) FROM c4)
```

Colour
Blue