МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ
УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ

**«БЕЛГОРОДСКИЙ ГОСУДАРСТВЕННЫЙ
ТЕХНОЛОГИЧЕСКИЙ УНИВЕРСИТЕТ им. В. Г.
ШУХОВА» (БГТУ им. В.Г. Шухова)**

Кафедра программного обеспечения вычислительной техники и автоматизированных систем

Лабораторная работа №6

по дисциплине: Базы данных
тема: «Организация взаимодействия с базой данных через приложение с графическим интерфейсом»

Выполнил: ст. группы ПВ-223
Дмитриев Андрей Александрович

Проверил:
Панченко Максим Владимирович

Белгород 2024 г.

Вариант 2.

Цель работы: получение навыков разработки приложений для взаимодействия с базой данных, содержащих графический интерфейс пользователя.

Задание к работе:

1. Изучить библиотеку для реализации приложения с графическим интерфейсом на выбранном языке программирования.

2. Разработать приложение с графическим интерфейсом, которое обеспечит подключение к базе данных, разработанной на основе предыдущих лабораторных работ, а также обеспечит выполнение запросов.

Ход работы:

Приложение с графическим интерфейсом реализовано с ипользованием библиотеки android-compose. Как СУБД используется SQLite в место PostgreSQL из-за наличия сложностей в установке соединения.

Полный код находится по ссылке:
https://github.com/AnDreV133/SimpleStore/tree/master-lab6.

Некоторые части исходного кода:

```
object StateManager {
    open class State {
        class NoConnection : State()
        class ChangeStore : State()
        class History(val storeId: Long) : State()
        class Menu(val storeId: Long) : State()
        class Shopping(val storeId: Long) : State()
        class Rating(val storeId: Long) : State()
    }

    private val stackState = Stack<State>()

    @Composable
    fun Screen(conn: SQLiteDatabase?) {
        val state = remember {
            mutableStateOf(
                if (conn != null) State.ChangeStore()
                else State.NoConnection()
            )
        }

        val activity = (LocalContext.current as? Activity)
        BackHandler {
            rollback(state, activity)
        }

        when (state.value) {
            is State.NoConnection -> {
                stackState.push(state.value as State.NoConnection)
                Text(
                    modifier = Modifier
                        .fillMaxSize()
                        .padding(16.dp),
                    textAlign = TextAlign.Center,
                    fontSize = 24.sp,
                    text = "No connection"
                )
            }
```

```
            is State.ChangeStore -> {
                stackState.push(state.value as State.ChangeStore)
                ChangeStore.Screen(conn!!, state)
            }

            is State.Menu -> {
                val castedState = state.value as State.Menu
                stackState.push(castedState)
                Menu.Screen(castedState.storeId, state)
            }

            is State.History -> {
                val castedState = state.value as State.History
                stackState.push(castedState)
                History.Screen(conn!!, castedState.storeId)
            }

            is State.Shopping -> {
                val castedState = state.value as State.Shopping
                stackState.push(castedState)
                Shopping.Screen(conn!!, castedState.storeId) { rollback(state,
activity) }
            }

            is State.Rating -> {
                val castedState = state.value as State.Rating
                stackState.push(castedState)
                Rating.Screen(conn!!, castedState.storeId)
            }
        }
    }

    private fun rollback(state: MutableState<State>, activity: Activity? = null) {
        if (stackState.size >= 1) {
            stackState.pop()
            state.value = stackState.pop()
        } else
            activity?.finish()
    }

}
```

```
object ChangeStore {
    class Model(val id: Long, val address: String)

    @Composable
    fun Screen(conn: SQLiteDatabase, state: MutableState<StateManager.State>) {
        DrawerMenu(
            menuItems = conn.executeStores().map { model ->
                "id: ${model.id} by address: ${model.address}" to
                        StateManager.State.Menu(model.id)
            },
            state = state
        )
    }

    private fun SQLiteDatabase.executeStores(): MutableList<Model> =
        mutableListOf<Model>().apply {
            this@executeStores.query("select * from ${Table.Store.T_NAME};") {
                if (it == null) return@query

                while (it.moveToNext()) {
                    add(
                        Model(
                            it.getLong(0),
```

```
                            it.getString(1)
                        )
                    )
                }
            }
        }
}
object Menu {
    @Composable
    fun Screen(storeId: Long, state: MutableState<StateManager.State>) {
        DrawerMenu(
            menuItems = listOf(
                "Сделать покупку" to StateManager.State.Shopping(storeId),
                "История покупок" to StateManager.State.History(storeId),
                "Рейтинг товаров по магазину" to StateManager.State.Rating(storeId),
            ),
            state = state
        )
    }
}
```

```
object Shopping {
    private class Model(
        val article: Long,
        val productName: String,
        val amount: Double,
        val quan: String,
        val price: Double
    )

    class Purchase(
        val article: Long,
        val productName: String,
        var amount: Double,
        val maxAmount: Double
    )

    @Composable
    fun Screen(conn: SQLiteDatabase, storeId: Long, rollback: ()-> Unit) {…}

    private fun SQLiteDatabase.queryAssortment(storeId: Long): MutableList<Model> {
        val res = mutableListOf<Model>()

        query(
            """
            select  t0.${Table.Accounting.PRODUCT_ARTICLE},
                    t1.${Table.Product.NAME},
                    t0.${Table.Accounting.AMOUNT},
                    t1.${Table.Product.QUANTITY_TO_ASSESS},
                    t0.${Table.Accounting.COST}
                from ${Table.Accounting.T_NAME} as t0
                inner join ${Table.Product.T_NAME} as t1
                on t0.${Table.Accounting.PRODUCT_ARTICLE}=t1.${Table.Product.ARTICLE}
                where ${Table.Accounting.STORE_ID}=$storeId;
            """
        ) { model ->
            if (model == null) return@query

            while (model.moveToNext()) {
                res.add(
                    Model(
                        model.getLong(0),
                        model.getString(1),
                        model.getDouble(2),
                        model.getString(3),
                        model.getDouble(4)
                    )
```

```
                )
            }
        }

        return res
    }

    private fun SQLiteDatabase.executeBuy(
        storeId: Long,
        purchases: List<Purchase>,
    ): Boolean {
        var res = false
        try {
            beginTransaction()
            val checkId = insert(
                Table.CheckList.T_NAME,
                null,
                ContentValues().apply {
                    put(Table.CheckList.STORE_ID, storeId)
                    put(Table.CheckList.TIME, Calendar.getInstance().time.time)
                }
            )

            purchases.forEach { purchase ->
                insert(
                    Table.Purchase.T_NAME, null,
                    ContentValues().apply {
                        put(Table.Purchase.CHECK_LIST_ID, checkId)
                        put(Table.Purchase.PRODUCT_ARTICLE, purchase.article)
                        put(Table.Purchase.AMOUNT, purchase.amount)
                    })

                execute(
                    """
                        UPDATE ${Table.Accounting.T_NAME}
                            SET ${Table.Accounting.AMOUNT}=${Table.Accounting.AMOUNT}-
${purchase.amount}
                            WHERE ${Table.Accounting.STORE_ID}=$storeId
                                AND
${Table.Accounting.PRODUCT_ARTICLE}=${purchase.article};

                        """
                )
            }

            res = true
            setTransactionSuccessful()
        } catch (e: SQLiteException) {
            Log.e("ShoppingState", e.toString())
        } finally {
            endTransaction()
        }

        return res
    }
}
```

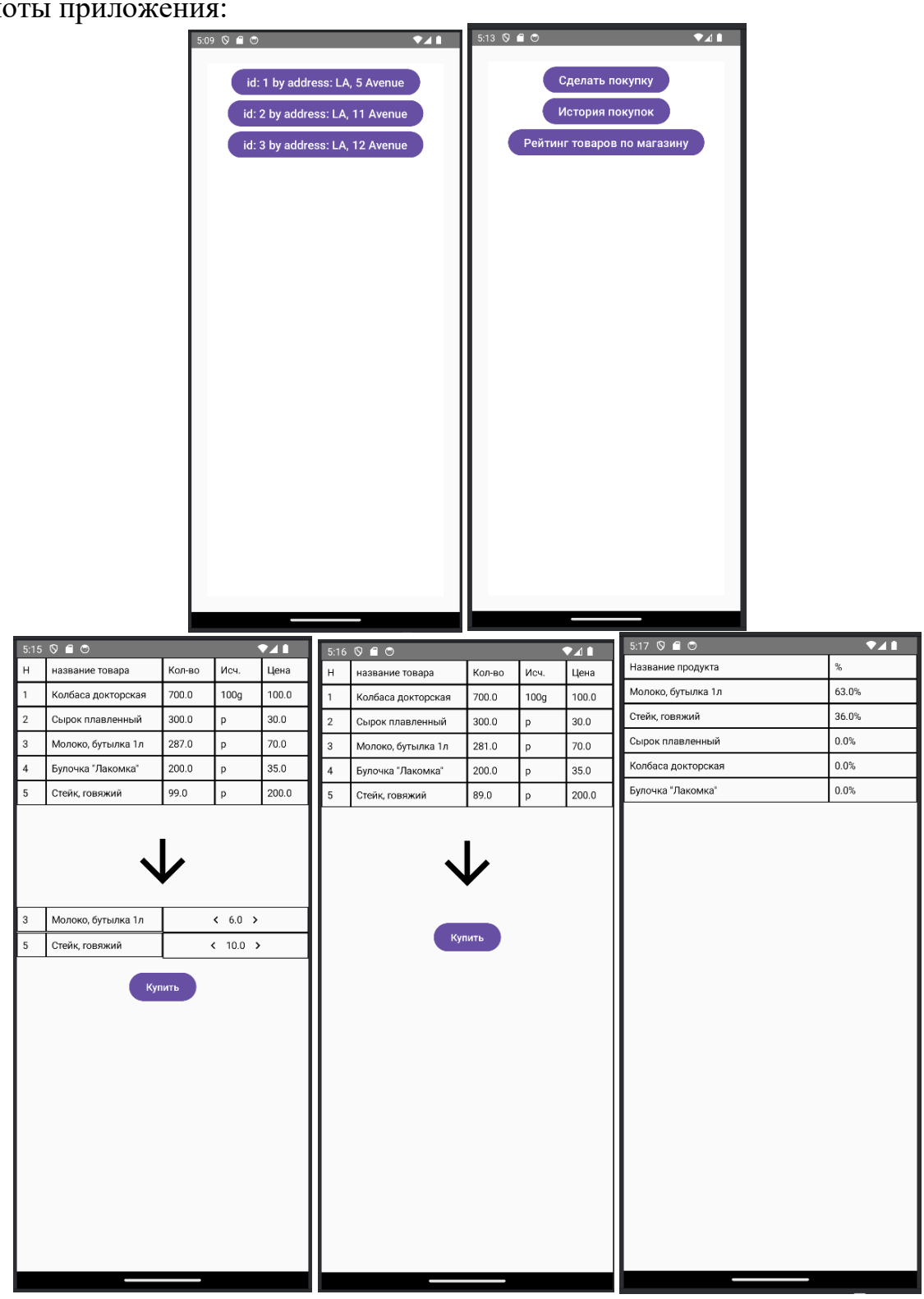
```
object History {
    class PurchaseModel(val name: String, val count: Double, val quan: String, val
price: Double)
    class PurchaseHistoryModel(val checkId: Long, val purchases: List<PurchaseModel>)

    @Composable
    fun Screen(conn: SQLiteDatabase, storeId: Long) {
        LazyColumn(
            modifier = Modifier
                .fillMaxWidth()
```

```
        ) {
            items(conn.queryGetHistory(storeId)) { model ->
                val modifier = Modifier.padding(bottom = 10.dp)
                Text(
                    modifier = modifier,
                    text = "Check Id: ${model.checkId}"
                )
                for (purchase in model.purchases) {
                    Text(
                        modifier = modifier,
                        text = "Name: ${purchase.name}, Count: ${purchase.count} in
${purchase.quan}, Price: ${purchase.price}"
                    )
                }
            }
        }
    }

    private fun SQLiteDatabase.queryGetHistory(storeId: Long):
List<PurchaseHistoryModel> {
        val res = mutableListOf<PurchaseHistoryModel>()
        query(
            """
        select  t0.${Table.CheckList.ID},
                t2.${Table.Product.NAME},
                t1.${Table.Purchase.AMOUNT},
                t2.${Table.Product.QUANTITY_TO_ASSESS},
                t1.${Table.Purchase.AMOUNT}*t3.${Table.Accounting.COST}
        from ${Table.CheckList.T_NAME} as t0
        inner join ${Table.Purchase.T_NAME} as t1
        on t0.${Table.CheckList.ID}=t1.${Table.Purchase.CHECK_LIST_ID}
            and t0.${Table.CheckList.STORE_ID}=$storeId
        inner join ${Table.Product.T_NAME} as t2
        on t1.${Table.Purchase.T_NAME}=t2.${Table.Product.ARTICLE}
        inner join ${Table.Accounting.T_NAME} as t3
        on t1.${Table.Purchase.PRODUCT_ARTICLE}=t3.${Table.Accounting.PRODUCT_ARTICLE}
            and t3.${Table.Accounting.STORE_ID}=$storeId
        order by t0.${Table.CheckList.ID} asc;
        """
        ) { cursor ->
            if (cursor == null) return@query

            val checkListMap = mutableMapOf<Long, List<PurchaseModel>>()

            while (cursor.moveToNext()) {
                checkListMap.compute(
                    cursor.getLong(0)
                ) { k, v ->
                    (v?.toMutableList() ?: mutableListOf())
                        .apply {
                            add(
                                PurchaseModel(
                                    cursor.getString(1),
                                    cursor.getDouble(2),
                                    cursor.getString(3),
                                    cursor.getDouble(4)
                                )
                            )
                        }
                }
            }

            for (checkList in checkListMap) {
                res.add(PurchaseHistoryModel(checkList.key, checkList.value))
            }
        }
```

```
        return res
    }
}
```

```
object Rating {
    class Model(val name: String, val partInPercent: Double)

    @Composable
    fun Screen(conn: SQLiteDatabase, storeId: Long) {

        val products = conn.executeStatistic(storeId)

        val nameWeight = 0.7f
        val partInPercentWeight = 0.3f
        LazyColumn(modifier = Modifier.padding(bottom = 16.dp)) {
            item(products.size) {
                Row {
                    TableCellText(weight = nameWeight, text = "Название продукта")
                    TableCellText(weight = partInPercentWeight, text = "%")
                }
            }
            items(products) { model ->
                Row {
                    TableCellText(weight = nameWeight, text = model.name)
                    TableCellText(weight = partInPercentWeight, text =
"${model.partInPercent}%")
                }
            }
        }
    }

    fun SQLiteDatabase.executeStatistic(storeId: Long): List<Model> {
        val res = mutableListOf<Model>()
        query(
            """
            select  t2.${Table.Product.NAME},
                    round(coalesce(sum(t1.${Table.Purchase.AMOUNT})*100/(select
sum(amount)  from ${Table.Purchase.T_NAME}),0),2)
                        as amount_in_percent
                from check_list as t0
                inner join ${Table.Purchase.T_NAME} as t1
                on t0.id=t1.${Table.Purchase.CHECK_LIST_ID}
                    and t0.${Table.CheckList.STORE_ID}=$storeId
                right join ${Table.Product.T_NAME} as t2
                on t1.${Table.Purchase.PRODUCT_ARTICLE}=t2.${Table.Product.ARTICLE}
                group by t2.${Table.Product.NAME}
                order by amount_in_percent desc;
            """
        ) { cursor ->
            if (cursor == null) return@query

            while (cursor.moveToNext()) {
                res.add(
                    Model(
                        name = cursor.getString(0),
                        partInPercent = cursor.getDouble(1)
                    )
                )
            }
        }

        return res
    }
}
```

Скриншоты приложения:



Дополнительное задание.

Реализовать экран, на котором будет отображена консоль, через которую можно осуществлять запросы к базе данных.

Код решения:

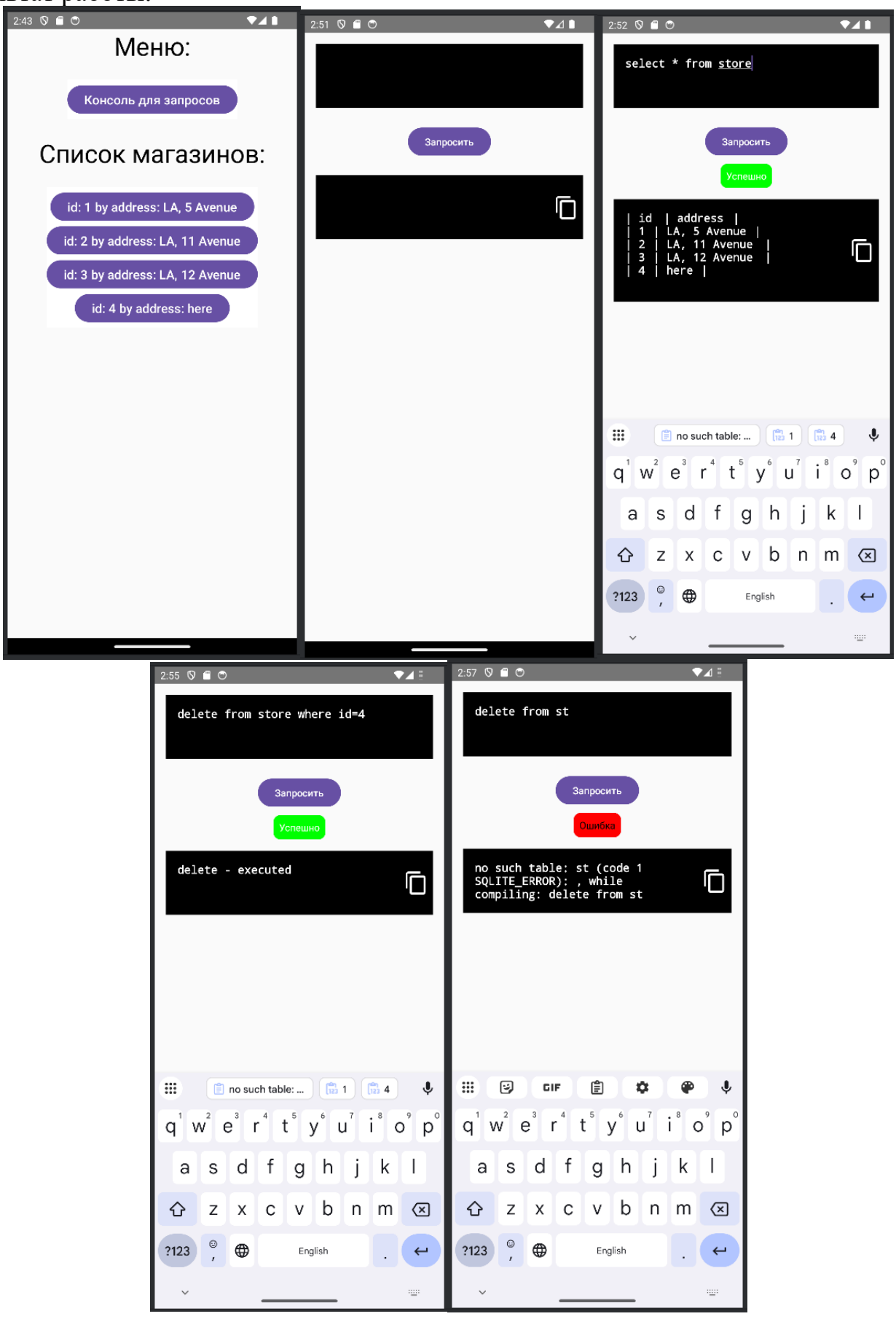
```
object Console {
    @Composable
    fun Screen(conn: SQLiteDatabase) {
        var textQuery by remember { mutableStateOf("") }
        var resultFromQuery by remember { mutableStateOf("") }
        var isExecuteSuccess by remember { mutableStateOf<Boolean?>(null) }
        val scope = rememberCoroutineScope()
```

```
        Column(
            modifier = Modifier
                .fillMaxSize(),
            horizontalAlignment = Alignment.CenterHorizontally,
        ) {
            CommandLineTextField(value = textQuery, onValueChange = { textQuery = it })

            Button(
                modifier = Modifier.padding(8.dp),
                onClick = {
                    scope.launch {
                        conn.sendExecuteAndGet(textQuery).fold(
                            onSuccess = {
                                isExecuteSuccess = true
                                resultFromQuery = it
                            },
                            onFailure = {
                                isExecuteSuccess = false
                                resultFromQuery = it.message ?: "Ошибка запроса"
                            }
                        )
                    }
                }
            ) {
                Text("Запросить")
            }

            if (isExecuteSuccess == true) {
                TextInColoredRoundedRect(
                    backgroundColor = Color.Green,
                    textColor = Color.White,
                    text = "Успешно"
                )
            } else if (isExecuteSuccess == false) {
                TextInColoredRoundedRect(
                    backgroundColor = Color.Red,
                    textColor = Color.Black,
                    text = "Ошибка"
                )
            }

            CommandLineTextField(
                value = resultFromQuery,
                onValueChange = {},
                readOnly = true,
                copyButton = true
            )
        }
    }

    @Composable
    fun TextInColoredRoundedRect(
        backgroundColor: Color,
        textColor: Color,
        text: String,
        modifier: Modifier = Modifier
    ) {
        Text(
            modifier = modifier
                .drawWithCache {
                    onDrawBehind {
                        drawRoundRect(
                            color = backgroundColor,
                            cornerRadius = CornerRadius(10.dp.toPx())
                        )
                    }
                }
```

```
                .padding(8.dp),
            color = textColor,
            text = text
        )
    }

    @Composable
    fun CommandLineTextField(
        value: String,
        onValueChange: (String) -> Unit,
        modifier: Modifier = Modifier,
        readOnly: Boolean = false,
        copyButton: Boolean = false,
    ) {
        val context = LocalContext.current

        Box(
            modifier = Modifier
                .fillMaxWidth()
                .padding(16.dp)
                .background(Color.Black)
        ) {
            Row(
                modifier = modifier,
                horizontalArrangement = Arrangement.SpaceBetween
            ) {
                TextField(
                    value = value,
                    onValueChange = onValueChange,
                    modifier = Modifier
                        .weight(1f)
                        .padding(end = 8.dp),
                    readOnly = readOnly,
                    textStyle = TextStyle(
                        color = Color.White,
                        fontFamily = FontFamily.Monospace,
                        fontSize = 16.sp,
                        fontWeight = FontWeight.Bold
                    ),
                    minLines = 3,
                    colors = TextFieldDefaults.colors(
                        focusedContainerColor = Color.Black,
                        unfocusedContainerColor = Color.Black,
                        focusedIndicatorColor = Color.Transparent,
                        unfocusedIndicatorColor = Color.Transparent,
                    )
                )

                if (copyButton)
                    IconButton(
                        onClick = {
                            copyToClipboard(context, value)
                        },
                        modifier = Modifier.align(Alignment.CenterVertically)
                    ) {
                        Icon(
                            imageVector = Icons.Default.ContentCopy,
                            tint = Color.White,
                            contentDescription = "copy button"
                        )
                    }
            }
        }
    }

    private fun copyToClipboard(context: Context, text: String) {
        val clipboardManager =
```

```
            context.getSystemService(Context.CLIPBOARD_SERVICE) as ClipboardManager
        val clipData = ClipData.newPlainText("command", text)
        clipboardManager.setPrimaryClip(clipData)
        Toast.makeText(context, "Command copied to clipboard",
Toast.LENGTH_SHORT).show()
    }

    private suspend fun SQLiteDatabase.sendExecuteAndGet(
        sql: String
    ): Result<String> = sql.trim().let {
        try {
            if (it.startsWith("SELECT", true)) {
                val sb = StringBuilder()
                val formatOutput = { list: List<String> ->
                    sb.append("| ")
                    for (item in list)
                        sb.append(item)
                            .append("\t | ")
                    sb.append("\n")
                }
                query(it) { cursor ->
                    if (cursor == null) return@query

                    formatOutput(cursor.columnNames.toList())

                    while (cursor.moveToNext())
                        formatOutput(
                            (0..<cursor.columnCount)
                                .map { i -> cursor.getString(i) }
                        )
                }
                Result.success(sb.toString())
            } else {
                execute(it)
                Result.success("${it.substringBefore(' ')} - executed")
            }
        } catch (e: SQLException) {
            Result.failure(e)
        }
    }
}
```

Результат работы:



Вывод: в ходе работы получены навыки разработки приложений для взаимодействия с базой данных, содержащих графический интерфейс пользователя.