

SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING

(AN AUTONOMOUS INSTITUTION,
AFFILIATED TO ANNA UNIVERSITY)

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ssn

SRI SIVASUBRAMANIYA NADAR
COLLEGE OF ENGINEERING, CHENNAI
(AN AUTONOMOUS INSTITUTION, AFFILIATED TO ANNA UNIVERSITY)

BONAFIDE CERTIFICATE

Certified that this is the bonafide record of the practical work done in the
USS1711 - MOBILE APPLICATION DEVELOPMENT Laboratory by

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Register Number 205001057

Semester VII

Branch COMPUTER SCIENCE AND ENGINEERING

Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam.

During the Academic year 2023-24

Faculty

Vol
27/11/23

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Submitted for the END SEMESTER Practical Examination held at SSNCE
on. 29/11/2023

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Name : KRITHIKA SWAMINATHAN Reg. No. 205001057

Sem : VII Sec : A

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Exercise 1 – Application using GUI components, Font, Colours, Layout Managers and Event Listeners

Date: 27/08/2023

Aim:

To generate a Health Insurance registration form to register the patient details under each group.

Code:

```
//activity_main.xml

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <ScrollView
        android:layout_width="402dp"
        android:layout_height="723dp"
        tools:layout_editor_absoluteX="5dp"
        tools:layout_editor_absoluteY="22dp">

        <LinearLayout
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:orientation="vertical">

            <TextView
                android:id="@+id/title"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:fontFamily="serif"
                android:text="Patient Registration Form"
                android:textSize="23sp"
                android:textStyle="bold" />
        
```

```
<TextView
    android:id="@+id/patient_legend"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:fontFamily="serif"
    android:text="Patient Details"
    android:textSize="18sp"
    android:textStyle="bold" />

<TextView
    android:id="@+id/name_ph"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Name:"
    android:textSize="17sp"
    tools:fontFamily="serif" />

<EditText
    android:id="@+id/name_value"
    android:layout_width="210dp"
    android:layout_height="43dp"
    android:ems="10"
    android:fontFamily="serif"
    android:inputType="textPersonName"
    android:textSize="17sp" />

<TextView
    android:id="@+id/address_ph"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Address:"
    android:textSize="17sp"
    tools:fontFamily="serif" />

<EditText
    android:id="@+id/addr_val1"
    android:layout_width="213dp"
    android:layout_height="31dp"
    android:ems="10"
    android:fontFamily="serif"
    android:inputType="textPersonName"
    android:textSize="17sp" />

<EditText
    android:id="@+id/addr_val2"
    android:layout_width="213dp"
```

```
        android:layout_height="33dp"
        android:ems="10"
        android:fontFamily="serif"
        android:inputType="textPersonName"
        android:textSize="17sp" />

    <EditText
        android:id="@+id/addr_val3"
        android:layout_width="213dp"
        android:layout_height="27dp"
        android:ems="10"
        android:fontFamily="serif"
        android:inputType="textPersonName"
        android:textSize="17sp" />

    <TextView
        android:id="@+id/PhNo_ph"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Phone no.: "
        android:textSize="17sp"
        tools:fontFamily="serif" />

    <CheckBox
        android:id="@+id/mobile_chk"
        android:layout_width="95dp"
        android:layout_height="29dp"
        android:text="Mobile"

        android:textSize="15sp"
        tools:fontFamily="serif" />

    <EditText
        android:id="@+id/mobile_value"
        android:layout_width="111dp"
        android:layout_height="49dp"
        android:ems="10"
        android:inputType="phone" />

    <CheckBox
        android:id="@+id/landline_chk"
        android:layout_width="101dp"
        android:layout_height="28dp"
        android:text="Landline"
        android:textSize="15sp"
        tools:fontFamily="serif" />
```

```
<EditText
    android:id="@+id/landline_value"
    android:layout_width="106dp"
    android:layout_height="43dp"
    android:ems="10"
    android:inputType="phone" />

<TextView
    android:id="@+id/age_ph"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Age:"
    android:textSize="17sp"
    tools:fontFamily="serif" />

<TextView
    android:id="@+id/dob_ph"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Date of Birth:"
    android:textSize="17sp"
    tools:fontFamily="serif" />

<EditText
    android:id="@+id/dob_value"
    android:layout_width="141dp"
    android:layout_height="44dp"
    android:ems="10"
    android:inputType="date"
    android:textSize="10sp" />

<TextView
    android:id="@+id/gen_ph"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Gender:"
    android:textSize="17sp"
    tools:fontFamily="serif" />

<RadioButton
    android:id="@+id/female_radio"
    android:layout_width="64dp"
    android:layout_height="38dp"
    android:text="F"
    tools:fontFamily="serif" />
```

```
<RadioButton
    android:id="@+id/male_radio"
    android:layout_width="64dp"
    android:layout_height="38dp"
    android:text="M"
    tools:fontFamily="serif" />

<RadioButton
    android:id="@+id/others_radio"
    android:layout_width="86dp"
    android:layout_height="38dp"
    android:text="Others"
    tools:fontFamily="serif" />

<TextView
    android:id="@+id/marital_ph"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Marital Status:"
    android:textSize="17sp"
    tools:fontFamily="serif" />

<Spinner
    android:id="@+id/spinner"
    android:layout_width="204dp"
    android:layout_height="31dp" />

<TextView
    android:id="@+id/emp_legend"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:fontFamily="serif"
    android:text="Employer Details"
    android:textSize="18sp"
    android:textStyle="bold" />

<TextView
    android:id="@+id/empName_ph"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Name:"
    android:textSize="17sp"
    tools:fontFamily="serif" />

<EditText
```

```
        android:id="@+id/empName_val"
        android:layout_width="210dp"
        android:layout_height="43dp"
        android:ems="10"
        android:fontFamily="serif"
        android:inputType="textPersonName"
        android:textSize="17sp" />

    <TextView
        android:id="@+id/empStatus_ph"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Status: "
        android:textSize="17sp"
        tools:fontFamily="serif" />

    <CheckBox
        android:id="@+id/fulltime_val"
        android:layout_width="130dp"
        android:layout_height="33dp"
        android:text="Full Time" />

    <CheckBox
        android:id="@+id/parttime_val"
        android:layout_width="130dp"
        android:layout_height="33dp"
        android:text="Part Time" />

    <CheckBox
        android:id="@+id/unem_val"
        android:layout_width="120dp"
        android:layout_height="38dp"
        android:text="Unemployed" />

    <CheckBox
        android:id="@+id/retired_val"
        android:layout_width="120dp"
        android:layout_height="23dp"
        android:text="Retired" />

    <CheckBox
        android:id="@+id/stud_val"
        android:layout_width="122dp"
        android:layout_height="26dp"
        android:text="Student" />
```

```
<CheckBox
    android:id="@+id/other_val"
    android:layout_width="122dp"
    android:layout_height="38dp"
    android:text="Other" />

<TextView
    android:id="@+id/contact_legend"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:fontFamily="serif"
    android:text="Emergency Contact Details"
    android:textSize="18sp"
    android:textStyle="bold" />

<TextView
    android:id="@+id/contactName_ph"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:text="Name:"
    android:textSize="17sp"
    tools:fontFamily="serif" />

<EditText
    android:id="@+id/contactName_val"
    android:layout_width="240dp"
    android:layout_height="wrap_content"
    android:ems="10"
    android:fontFamily="serif"
    android:inputType="textPersonName"
    android:textSize="17sp" />

<TextView
    android:id="@+id/contactRship_ph"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:text="Relationship:"
    android:textSize="17sp"
    tools:fontFamily="serif" />

<EditText
    android:id="@+id/contactRship_val"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:ems="10"
    android:fontFamily="serif"
```

```
        android:inputType="textPersonName"
        android:textSize="17sp" />

    <TextView
        android:id="@+id/contactAddress_ph"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:text="Address:"
        android:textSize="17sp"
        tools:fontFamily="serif" />

    <EditText
        android:id="@+id/contactAddr_val1"
        android:layout_width="wrap_content"
        android:layout_height="34dp"
        android:ems="10"
        android:fontFamily="serif"
        android:inputType="textPersonName"
        android:textSize="17sp" />

    <EditText
        android:id="@+id/contactAddr_val2"
        android:layout_width="wrap_content"
        android:layout_height="28dp"
        android:ems="10"
        android:fontFamily="serif"
        android:inputType="textPersonName"
        android:textSize="17sp" />

    <EditText
        android:id="@+id/contactAddr_val3"
        android:layout_width="wrap_content"
        android:layout_height="21dp"
        android:ems="10"
        android:fontFamily="serif"
        android:inputType="textPersonName"
        android:textSize="17sp" />

    <TextView
        android:id="@+id/contactNo_ph"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:text="Phone no.: "
        android:textSize="17sp"
        tools:fontFamily="serif" />
```

```
<EditText  
    android:id="@+id/contactPhone_val"  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:ems="10"  
    android:inputType="phone" />  
  
</LinearLayout>  
</ScrollView>  
  
</androidx.constraintlayout.widget.ConstraintLayout>  
  
//MainActivity.java  
package com.sem7.lab.exercise1;  
  
import androidx.appcompat.app.AppCompatActivity;  
  
import android.app.DatePickerDialog;  
import android.os.Bundle;  
import android.view.View;  
import android.widget.ArrayAdapter;  
import android.widget.DatePicker;  
import android.widget.EditText;  
import android.widget.Spinner;  
  
import java.util.Calendar;  
  
public class MainActivity extends AppCompatActivity {  
  
    EditText date;  
    DatePickerDialog datePickerDialog;  
  
    @Override  
    protected void onCreate(Bundle savedInstanceState) {  
        super.onCreate(savedInstanceState);  
        setContentView(R.layout.activity_main);  
  
        Spinner spinner = (Spinner) findViewById(R.id.spinner);  
        // Create an ArrayAdapter using the string array and a default spinner  
        layout  
        ArrayAdapter<CharSequence> adapter = ArrayAdapter.createFromResource(this,  
            R.array.marital_array, android.R.layout.simple_spinner_item);  
        // Specify the layout to use when the list of choices appears  
  
        adapter.setDropDownViewResource(android.R.layout.simple_spinner_dropdown_item);
```

```
// Apply the adapter to the spinner
spinner.setAdapter(adapter);

// initiate the date picker and a button
date = (EditText) findViewById(R.id.dob_value);
// perform click event on edit text
date.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // calendar class's instance and get current date , month and year
from calendar
        final Calendar c = Calendar.getInstance();
        int mYear = c.get(Calendar.YEAR); // current year
        int mMonth = c.get(Calendar.MONTH); // current month
        int mDay = c.get(Calendar.DAY_OF_MONTH); // current day
        // date picker dialog
        datePickerDialog = new DatePickerDialog(MainActivity.this,
            new DatePickerDialog.OnDateSetListener() {

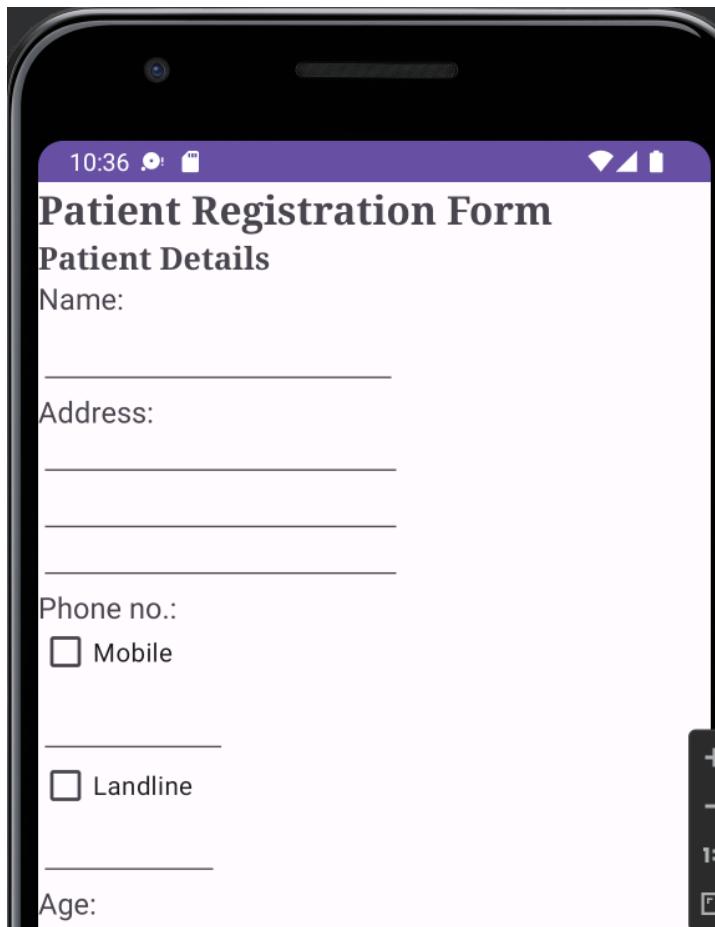
                @Override
                public void onDateSet(DatePicker view, int year,
                        int monthOfYear, int dayOfMonth)
{
                // set day of month , month and year value in the
edit text
                date.setText(dayOfMonth + "/"
+ (monthOfYear + 1) + "/" + year);

            }
        }, mYear, mMonth, mDay);
        datePickerDialog.show();
    }
});
```

}

```
//strings.xml
<resources>
    <string name="app_name">Exercise1</string>
    <string-array name="marital_array">
        <item>Married</item>
        <item>Unmarried</item>
    </string-array>
</resources>
```

Output:



Date of Birth:

Gender:

F

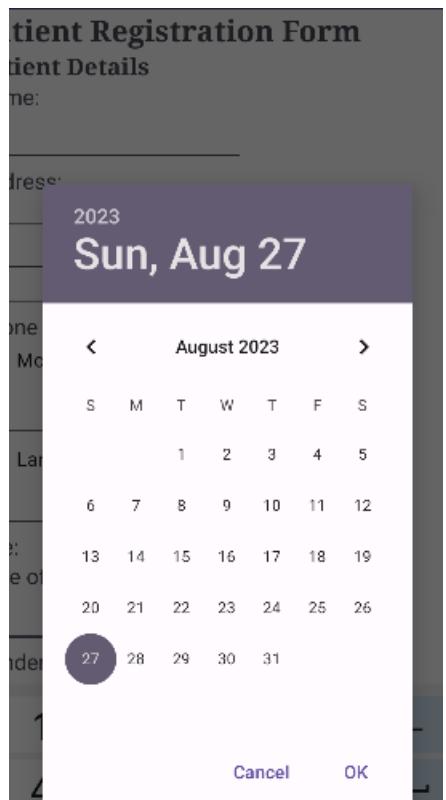
M

Others

Marital Status:

Married

Unmarried



Marital Status:

Item 1 ▾

Employer Details

Name:

Status:

- Full Time
- Part Time
- Unemployed
- Retired
- Student
- Other

Emergency Contact Details

Name:

Relationship:

Address:

Phone no.:

Learning outcomes:

- The first android app was designed and implemented.
 - A registration form was designed for a mobile application.
-

Exercise 2 – Simulation of Virtual Keyboard

Date: 06/09/2023

Aim:

Create an Android mobile application which simulates a virtual keyboard.

Code:

```
//activity_main.xml

<?xml version="1.0" encoding="utf-8"?>

<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <Button
        android:id="@+id/n4"
        android:layout_width="40dp"
        android:layout_height="37dp"
        android:text="4"
        android:textSize="13dp"
        app:backgroundTint="#7741D8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.625"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.913" />

    <Button
        android:id="@+id/n9"
        android:layout_width="40dp"
        android:layout_height="37dp"
        android:text="9"
        android:textSize="13dp"
        app:backgroundTint="#7741D8"
```

```
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.625"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.966" />

    <Button
        android:id="@+id/n0"
        android:layout_width="40dp"
        android:layout_height="37dp"
        android:text="0"
        android:textSize="13dp"
        app:backgroundTint="#7741D8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.115"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.913" />

    <Button
        android:id="@+id/n1"
        android:layout_width="40dp"
        android:layout_height="37dp"
        android:text="1"
        android:textSize="13dp"
        app:backgroundTint="#7741D8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.239"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.913" />

    <Button
        android:id="@+id/n7"
        android:layout_width="40dp"
        android:layout_height="37dp"
        android:text="7"
        android:textSize="13dp"
        app:backgroundTint="#7741D8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.369"
        app:layout_constraintStart_toStartOf="parent"
```

```
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.966" />

    <Button
        android:id="@+id/n6"
        android:layout_width="40dp"
        android:layout_height="37dp"
        android:text="6"
        android:textSize="13dp"
        app:backgroundTint="#7741D8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.884"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.913" />

    <Button
        android:id="@+id/n8"
        android:layout_width="40dp"
        android:layout_height="37dp"
        android:text="8"
        android:textSize="13dp"
        app:backgroundTint="#7741D8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.966" />

    <Button
        android:id="@+id/n2"
        android:layout_width="40dp"
        android:layout_height="37dp"
        android:text="2"
        android:textSize="13dp"
        app:backgroundTint="#7741D8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.369"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.913" />

    <Button
```

```
        android:id="@+id/n5"
        android:layout_width="40dp"
        android:layout_height="37dp"
        android:text="5"
        android:textSize="13dp"
        app:backgroundTint="#7741D8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.754"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.913" />

<Button
    android:id="@+id/n3"
    android:layout_width="40dp"
    android:layout_height="37dp"
    android:text="3"
    android:textSize="13dp"
    app:backgroundTint="#7741D8"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.498"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.913" />

<Button
    android:id="@+id/hide"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="clear"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.176"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.344" />

<Button
    android:id="@+id/show"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Type"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
```

```
    app:layout_constraintHorizontal_bias="0.82"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.344" />

<EditText
    android:id="@+id/edit"
    android:layout_width="296dp"
    android:layout_height="122dp"
    android:ems="10"
    android:gravity="start|top"
    android:inputType="textMultiLine"
    android:visibility="invisible"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.495"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.111" />

<Button
    android:id="@+id/e"
    android:layout_width="45dp"
    android:layout_height="55dp"
    android:text="E"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.743"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.44" />

<Button
    android:id="@+id/u"
    android:layout_width="45dp"
    android:layout_height="55dp"
    android:text="U"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.418"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.741" />

<Button
    android:id="@+id/g"
```

```
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="G"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.09"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.542" />

    <Button
        android:id="@+id/j"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="J"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.579"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.542" />

    <Button
        android:id="@+id/w"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="W"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.743"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.741" />

    <Button
        android:id="@+id/y"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="Y"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.418"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.837" />
```

```
<Button
    android:id="@+id/space"
    android:layout_width="104dp"
    android:layout_height="54dp"
    android:text="space"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.107"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.837" />

<Button
    android:id="@+id/backspace"
    android:layout_width="104dp"
    android:layout_height="54dp"
    android:text="Delete"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.892"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.838" />

<Button
    android:id="@+id/h"
    android:layout_width="45dp"
    android:layout_height="55dp"
    android:text="H"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.251"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.542" />

<Button
    android:id="@+id/p"
    android:layout_width="45dp"
    android:layout_height="55dp"
    android:text="P"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.579"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
```

```
    app:layout_constraintVertical_bias="0.643" />

    <Button
        android:id="@+id/o"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="O"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.418"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.643" />

    <Button
        android:id="@+id/i"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="I"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.418"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.542" />

    <Button
        android:id="@+id/x"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="X"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.909"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.741" />

    <Button
        android:id="@+id/d"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="D"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.579"
```

```
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.44" />

    <Button
        android:id="@+id/k"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="K"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.743"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.542" />

    <Button
        android:id="@+id/n"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="N"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.251"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.643" />

    <Button
        android:id="@+id/r"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="R"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.909"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.643" />

    <Button
        android:id="@+id/z"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="Z"
        app:layout_constraintBottom_toBottomOf="parent"
```

```
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.579"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.838" />

    <Button
        android:id="@+id/m"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="M"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.09"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.643" />

    <Button
        android:id="@+id/l"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="L"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.909"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.542" />

    <Button
        android:id="@+id/t"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="T"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.251"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.741" />

    <Button
        android:id="@+id/a"
        android:layout_width="45dp"
        android:layout_height="55dp"
```

```
        android:text="A"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.09"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.44" />

<Button
    android:id="@+id/q"
    android:layout_width="45dp"
    android:layout_height="55dp"
    android:text="Q"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.743"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.643" />

<Button
    android:id="@+id/b"
    android:layout_width="45dp"
    android:layout_height="55dp"
    android:text="B"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.251"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.44" />

<Button
    android:id="@+id/c"
    android:layout_width="45dp"
    android:layout_height="55dp"
    android:text="C"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.418"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.44" />

<Button
    android:id="@+id/s"
```

```
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="S"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.09"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.741" />

    <Button
        android:id="@+id/v"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="V"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.579"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.741" />

    <Button
        android:id="@+id/f"
        android:layout_width="45dp"
        android:layout_height="55dp"
        android:text="F"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.909"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.44" />

</androidx.constraintlayout.widget.ConstraintLayout>

<!--
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <TextView
        android:id="@+id/textView"
```

```
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_alignParentTop="true"
        android:layout_marginLeft="20dp"
        android:layout_marginRight="20dp"
        android:layout_marginTop="278dp"
        android:layout_marginBottom="10dp"
        android:background="#EAEAEA"
        android:gravity="bottom"
        android:maxLines="5"
        android:padding="16dp"
        android:scrollbars="vertical"
        android:textColor="#000000" />

<GridLayout
    android:id="@+id/gridLayout"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_below="@+id/textView"
    android:columnCount="6"
    android:rowCount="6"
    android:layout_margin="3dp"
    android:layout_centerInParent="true">

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="1" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="2" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="3" />

    <Button>
```

```
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="4" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="5" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="6" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="7" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="8" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="9" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
```

```
        android:text="0" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="Q" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="W" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="E" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="R" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="T" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="Y" />

    <Button
        android:layout_width="0dp"
```

```
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="U" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="I" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="O" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="P" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="A" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="S" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="D" />
```

```
<Button
    android:layout_width="0dp"
    android:layout_height="wrap_content"
    android:layout_columnWeight="1"
    android:layout_rowWeight="1"
    android:text="F" />

<Button
    android:layout_width="0dp"
    android:layout_height="wrap_content"
    android:layout_columnWeight="1"
    android:layout_rowWeight="1"
    android:text="G" />

<Button
    android:layout_width="0dp"
    android:layout_height="wrap_content"
    android:layout_columnWeight="1"
    android:layout_rowWeight="1"
    android:text="H" />

<Button
    android:layout_width="0dp"
    android:layout_height="wrap_content"
    android:layout_columnWeight="1"
    android:layout_rowWeight="1"
    android:text="J" />

<Button
    android:layout_width="0dp"
    android:layout_height="wrap_content"
    android:layout_columnWeight="1"
    android:layout_rowWeight="1"
    android:text="K" />

<Button
    android:layout_width="0dp"
    android:layout_height="wrap_content"
    android:layout_columnWeight="1"
    android:layout_rowWeight="1"
    android:text="L" />

<Button
    android:layout_width="0dp"
    android:layout_height="wrap_content"
```

```
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="Z" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="X" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="C" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="V" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="B" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="N" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:text="M" />
```

```
</GridLayout>

<GridLayout
    android:id="@+id/clearLayout"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_below="@id/gridLayout"
    android:columnCount="2"
    android:rowCount="1"
    android:layout_margin="3dp"
    android:layout_centerInParent="true">

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:textSize="14dp"
        android:text="DEL" />

    <Button
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_columnWeight="1"
        android:layout_rowWeight="1"
        android:textSize="14dp"
        android:text="CLR" />

</GridLayout>

</RelativeLayout>
-->
</androidx.constraintlayout.widget.ConstraintLayout>

//MainActivity.java
package com.sem7.lab.exercise2;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.GridLayout;
import android.widget.TextView;
```

```
public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        Button show= (Button) findViewById(R.id.show);
        Button hide=(Button) findViewById(R.id.hide);
        EditText text=(EditText) findViewById(R.id.edit);
        Button a= (Button) findViewById(R.id.a);
        Button b=(Button) findViewById(R.id.b);
        Button c=(Button) findViewById(R.id.c);
        Button d=(Button) findViewById(R.id.d);
        Button e=(Button) findViewById(R.id.e);
        Button f= (Button) findViewById(R.id.f);
        Button g=(Button) findViewById(R.id.g);
        Button h=(Button) findViewById(R.id.h);
        Button i=(Button) findViewById(R.id.i);
        Button j=(Button) findViewById(R.id.j);
        Button k=(Button) findViewById(R.id.k);
        Button l=(Button) findViewById(R.id.l);
        Button m=(Button) findViewById(R.id.m);
        Button n=(Button) findViewById(R.id.n);
        Button o=(Button) findViewById(R.id.o);
        Button p=(Button) findViewById(R.id.p);
        Button q=(Button) findViewById(R.id.q);
        Button r=(Button) findViewById(R.id.r);
        Button s=(Button) findViewById(R.id.s);
        Button t=(Button) findViewById(R.id.t);
        Button u=(Button) findViewById(R.id.u);
        Button v=(Button) findViewById(R.id.v);
        Button w=(Button) findViewById(R.id.w);
        Button x=(Button) findViewById(R.id.x);
        Button y=(Button) findViewById(R.id.y);
        Button z=(Button) findViewById(R.id.z);
        Button n0=(Button) findViewById(R.id.n0);
        Button n1=(Button) findViewById(R.id.n1);
        Button n2=(Button) findViewById(R.id.n2);
        Button n3=(Button) findViewById(R.id.n3);
        Button n4=(Button) findViewById(R.id.n4);
        Button n5=(Button) findViewById(R.id.n5);
        Button n6=(Button) findViewById(R.id.n6);
        Button n8=(Button) findViewById(R.id.n8);
        Button n9=(Button) findViewById(R.id.n9);
```

```
Button n7=(Button) findViewById(R.id.n7);
Button space=(Button) findViewById(R.id.space);
Button backspace=(Button) findViewById(R.id.backspace);

show.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setVisibility(View.VISIBLE);
        //text.setText(text.getText().toString() + "A");
    }
});

// Set onClickListener for the "Hide" button
hide.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText not visible (Gone)
        text.setText("");
    }
});

a.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "A");
    }
});

b.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "B");
    }
});

c.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "C");
    }
});
```

```
d.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "D");
    }
});

e.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "E");
    }
});

f.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "F");
    }
});

g.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "G");
    }
});

h.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "H");
    }
});

i.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "I");
    }
});
```

```
});  
  
j.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + "J");  
    }  
});  
  
k.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + "K");  
    }  
});  
  
l.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + "L");  
    }  
});  
  
m.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + "M");  
    }  
});  
  
n.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + "N");  
    }  
});  
  
o.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible
```

```
        text.setText(text.getText().toString() + "0");
    }
});

p.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "P");
    }
});

q.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "Q");
    }
});

r.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "R");
    }
});

s.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "S");
    }
});

t.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "T");
    }
});

u.setOnClickListener(new View.OnClickListener() {
    @Override
```

```
        public void onClick(View v) {
            // Make the EditText visible
            text.setText(text.getText().toString() + "U");
        }
    });

    v.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            // Make the EditText visible
            text.setText(text.getText().toString() + "V");
        }
    });

    w.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            // Make the EditText visible
            text.setText(text.getText().toString() + "W");
        }
    });

    x.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            // Make the EditText visible
            text.setText(text.getText().toString() + "X");
        }
    });

    y.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            // Make the EditText visible
            text.setText(text.getText().toString() + "Y");
        }
    });

    z.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            // Make the EditText visible
            text.setText(text.getText().toString() + "Z");
        }
    });
}
```

```
n0.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "0");
    }
});

n1.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "1");
    }
});

n2.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "2");
    }
});

n3.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "3");
    }
});

n4.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "4");
    }
});

n5.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        // Make the EditText visible
        text.setText(text.getText().toString() + "5");
    }
});
```

```
});  
  
n6.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + "6");  
    }  
});  
  
n7.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + "7");  
    }  
});  
  
n8.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + "8");  
    }  
});  
  
n9.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + "9");  
    }  
});  
  
space.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        text.setText(text.getText().toString() + " ");  
    }  
});  
  
backspace.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        // Make the EditText visible  
        if (text.getText().length() > 0) {  
            String textString = text.getText().toString();  
            text.setText(textString.substring(0, textString.length() - 1));  
        }  
    }  
});
```

```
        String s = textView.getText().toString();
        textView.setText(s.substring(0, s.length() - 1));
    }
});
}
/*
public class MainActivity extends AppCompatActivity {

    private TextView textView;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        textView = findViewById(R.id.textView);
        GridLayout gridLayout = findViewById(R.id.gridLayout);

        // Create a 2D array of characters for the keyboard layout
        final String[][] keyboardLayout = {
            {"1", "2", "3", "4", "5", "6"},
            {"7", "8", "9", "10", "Q", "W"},
            {"E", "R", "T", "Y", "U", "I"},
            {"O", "P", "A", "S", "D", "F"},
            {"G", "H", "J", "K", "L", "Z"},
            {"X", "C", "V", "B", "N", "M"}
        };
        for (int i = 0; i < keyboardLayout.length; i++) {
            for (int j = 0; j < keyboardLayout[i].length; j++) {
                Button button = new Button(this);
                button.setText(keyboardLayout[i][j]);
                button.setOnClickListener(new View.OnClickListener() {
                    @Override
                    public void onClick(View v) {
                        String buttonText = ((Button) v).getText().toString();

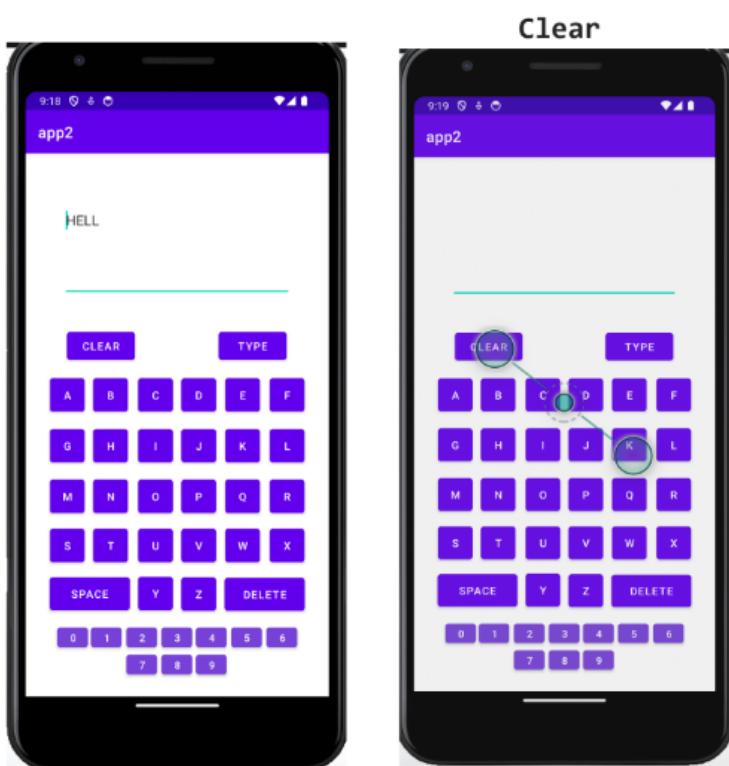
                        String currentText = textView.getText().toString();
                        textView.setText(currentText + buttonText);

                        /*if (buttonText.equals("DEL")) {
                            String currentText = textView.getText().toString();
                            if (currentText.length() > 0) {
                                textView.setText(currentText.substring(0,
currentText.length() - 1));
                        }
                    }
                });
            }
        }
    }
}
```

```
        }
    } else {
        String currentText = textView.getText().toString();
        textView.setText(currentText + buttonText);
    }
}
});

gridLayout.addView(button);
}
}
}
*/
}
```

Output:



Learning outcomes:

- The second android app was designed and implemented.
 - A virtual keyboard was designed for a mobile application.
-

Exercise 3 – Application using Graphical Primitives

Date: 17/09/2023

Aim:

Design a CAR using Shape drawables with the help of relevant shapes such as Line, Circle, Rectangle and Arc.

Code:

```
//activity_main.xml

<?xml version="1.0" encoding="utf-8"?>

<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">
    <!-- activity_main.xml -->

    <ImageView
        android:id="@+id/imageView"
        android:layout_width="125dp"
        android:layout_height="167dp"
        android:rotation="90"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.646"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.028"
        app:srcCompat="@drawable/car" />

    <Button
        android:id="@+id/forward"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:rotation="90"
```

```
        android:text="Forward"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.052"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.279" />

    <Button
        android:id="@+id/backward"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:rotation="90"
        android:text="backward"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.017"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.775" />
</androidx.constraintlayout.widget.ConstraintLayout>
```

```
//MainActivity.java
package com.sem7.lab.exercise3;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.ImageView;

public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        ImageView carImageView;
        Button forwardButton;
        Button backwardButton;
        final float[] carRotation = {90};
        final int[] fd = {1};
        final boolean[] isZoomed = {false};
```

```
carImageView = findViewById(R.id.imageView);
forwardButton = findViewById(R.id.forward);
backwardButton = findViewById(R.id.backward);

forwardButton.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        if (fd[0] == 0){
            carRotation[0] += 180;
            carImageView.setRotation(carRotation[0]);
            fd[0] = 1;
        }
        float currentY = carImageView.getTranslationY();
        carImageView.setTranslationY(currentY+20);
    }
});

backwardButton.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        if (fd[0] == 1) {
            carRotation[0] += 180;
            carImageView.setRotation(carRotation[0]);
            fd[0] = 0;
        }
        float currentY = carImageView.getTranslationY();
        carImageView.setTranslationY(currentY-20);
    }
});

carImageView.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        if (isZoomed[0]) {
            // Zoom out
            carImageView.setScaleX(1.0f);
            carImageView.setScaleY(1.0f);
            isZoomed[0] = false;
        } else {
            // Zoom in
            carImageView.setScaleX(2.0f);
            carImageView.setScaleY(2.0f);
            isZoomed[0] = true;
        }
    }
});
```

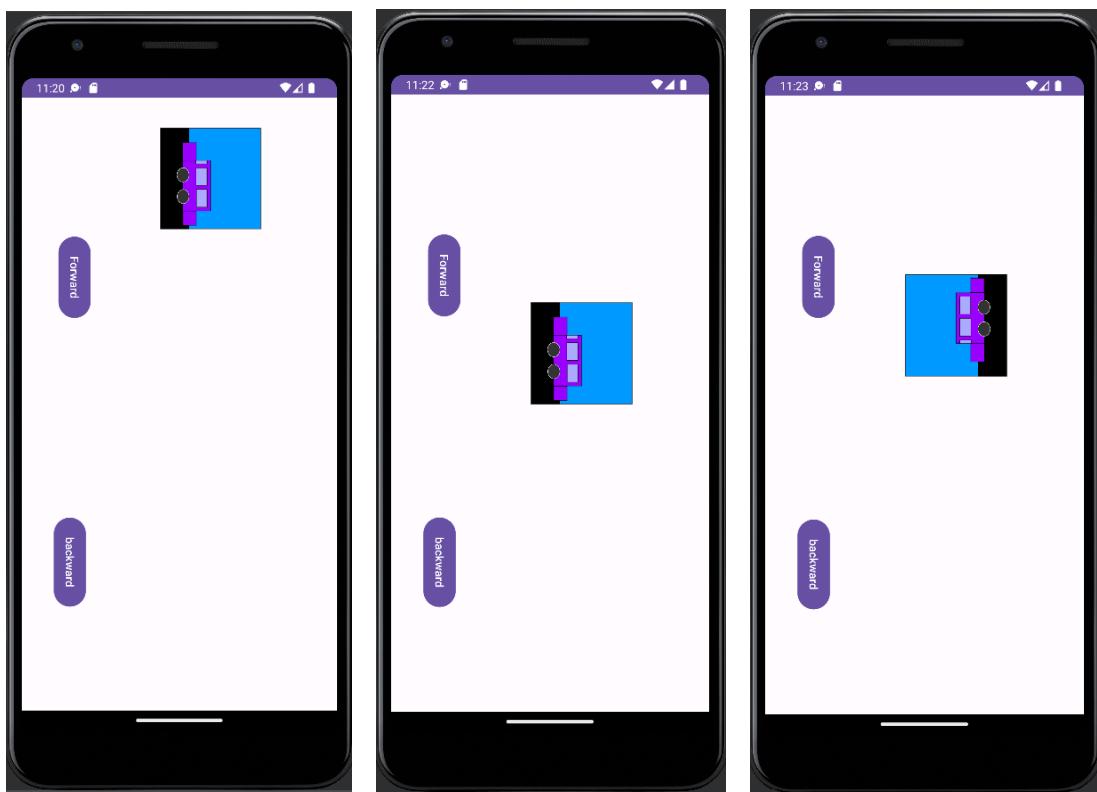
```
        });
    }
}

//car.xml
<?xml version="1.0" encoding="utf-8"?>
<layer-list xmlns:android="http://schemas.android.com/apk/res/android" >
    <item>
        <shape
            android:shape="rectangle">
            <size android:width="280dp" android:height="200dp"/>
            <stroke android:width="1dp" android:color="#000000" />
            <solid android:color="#0099ff" />
            <padding android:bottom="1dp"/>
        </shape>
    </item>
    <item android:top="200dp">
        <shape
            android:shape="rectangle">
            <size android:width="280dp" android:height="80dp"/>
            <stroke android:width="1dp" android:color="#000000" />
            <solid android:color="#000000" />
            <padding android:bottom="1dp"/>
        </shape>
    </item>
    <item android:left="40dp" android:top="180dp" android:bottom="60dp"
          android:right="50dp">
        <shape
            android:shape="rectangle">
            <stroke android:width="1dp" android:color="#000000" />
            <solid android:color="#9900ff" />
            <padding android:bottom="1dp"/>
        </shape>
    </item>
    <item android:left="90dp" android:top="140dp" android:bottom="60dp"
          android:right="50dp">
        <shape
            android:shape="rectangle">
            <stroke android:width="1dp" android:color="#000000" />
            <solid android:color="#9900ff" />
            <padding android:bottom="1dp"/>
        </shape>
    </item>
    <item android:left="230dp" android:top="180dp" android:bottom="60dp"
          android:right="10dp">
        <shape
```

```
        android:shape="rectangle">
        <stroke android:width="1dp" android:color="#000000" />
        <solid android:color="#9900ff" />
        <padding android:bottom="1dp"/>
    </shape>
</item>
<item android:left="90dp" android:top="150dp" android:bottom="95dp"
android:right="180dp">
    <shape
        android:shape="rectangle">
        <stroke android:width="1dp" android:color="#000000" />
        <solid android:color="#aaaaff" />
        <padding android:bottom="1dp"/>
    </shape>
</item>
<item android:left="110dp" android:top="150dp" android:bottom="95dp"
android:right="120dp">
    <shape
        android:shape="rectangle">
        <stroke android:width="1dp" android:color="#000000" />
        <solid android:color="#aaaaff" />
        <padding android:bottom="1dp"/>
    </shape>
</item>
<item android:left="170dp" android:top="150dp" android:bottom="95dp"
android:right="60dp">
    <shape
        android:shape="rectangle">
        <stroke android:width="1dp" android:color="#000000" />
        <solid android:color="#aaaaff" />
        <padding android:bottom="1dp"/>
    </shape>
</item>
<item android:left="110dp" android:top="200dp" android:bottom="40dp"
android:right="130dp">
    <shape
        android:shape="oval">
        <stroke android:width="1dp" android:color="#ffffff" />
        <solid android:color="#333333" />
        <padding android:bottom="1dp"/>
    </shape>
</item>
<item android:left="170dp" android:top="200dp" android:bottom="40dp"
android:right="70dp">
    <shape
        android:shape="oval">
```

```
<stroke android:width="1dp" android:color="#ffffffff" />
<solid android:color="#333333" />
<padding android:bottom="1dp"/>
</shape>
</item>
</layer-list>
```

Output:



Learning outcomes:

- Graphical primitives were implemented in the android app..
- A car was designed and animated for a mobile application.

Exercise 4 – Product Information Management App using SQLite

Date: 12/10/2023

Aim:

Develop a Product information application in Android that enables to perform CRUD operations on data stored in SQLite Database.

Code:

```
//activity_main.xml

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <LinearLayout
        android:layout_width="409dp"
        android:layout_height="729dp"
        android:orientation="vertical"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent">

        <TableLayout
            android:layout_width="match_parent"
            android:layout_height="match_parent"
            android:layout_margin="5dp"
            android:gravity="center_horizontal"
            android:stretchColumns="*"
            android:shrinkColumns="*">

            <TableRow
                android:id="@+id/title_row"
                android:layout_width="match_parent"
                android:layout_height="match_parent">
```

```
<TextView
    android:id="@+id/form_title"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_centerInParent="true"
    android:layout_margin="20dp"
    android:gravity="center_horizontal"
    android:padding="10dp"
    android:textColor="@color/black"
    android:textSize="30sp"
    android:textStyle="bold"
    android:text="Product Information" />
</TableRow>

<TableRow
    android:layout_width="match_parent"
    android:layout_height="match_parent" >

    <Button
        android:id="@+id/insert_btn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_centerInParent="true"
        android:layout_margin="10dp"
        android:gravity="center_horizontal"
        android:padding="10dp"
        android:text="INSERT"
        android:textColor="@color/white"
        android:textSize="20sp" />
</TableRow>

<TableRow
    android:layout_width="match_parent"
    android:layout_height="match_parent" >

    <Button
        android:id="@+id/update_btn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_centerInParent="true"
        android:layout_margin="10dp"
        android:gravity="center_horizontal"
        android:padding="10dp"
        android:text="UPDATE"
        android:textColor="@color/white"
```

```
        android:textSize="20sp" />
    </TableRow>

    <TableRow
        android:layout_width="match_parent"
        android:layout_height="match_parent" >

        <Button
            android:id="@+id/delete_btn"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_centerInParent="true"
            android:layout_margin="10dp"
            android:gravity="center_horizontal"
            android:padding="10dp"
            android:text="DELETE"
            android:textColor="@color/white"
            android:textSize="20sp" />
    </TableRow>

    <TableRow
        android:layout_width="match_parent"
        android:layout_height="match_parent" >

        <Button
            android:id="@+id/retrieve_btn"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_centerInParent="true"
            android:layout_margin="10dp"
            android:gravity="center_horizontal"
            android:padding="10dp"
            android:text="RETRIEVE"
            android:textColor="@color/white"
            android:textSize="20sp" />
    </TableRow>

    <TableRow
        android:layout_width="match_parent"
        android:layout_height="match_parent" >

        <Button
            android:id="@+id/retrieveAll_btn"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_centerInParent="true"
```



```
        android:layout_height="wrap_content"
        android:layout_centerInParent="true"
        android:layout_margin="20dp"
        android:gravity="center_horizontal"
        android:padding="10dp"
        android:text="Insert New Product"
        android:textColor="@color/black"
        android:textSize="30sp"
        android:textStyle="bold" />
    </TableRow>

    <TableRow
        android:id="@+id/prod_name"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_margin="5dp">

        <TextView
            android:id="@+id/prod_name_label"
            android:layout_width="0dp"
            android:layout_height="wrap_content"
            android:layout_weight="3"
            android:gravity="end"
            android:text="Name: "
            android:textSize="17sp" />

        <EditText
            android:id="@+id/prod_name_val"
            android:layout_width="0dp"
            android:layout_height="wrap_content"
            android:layout_weight="7"
            android:ems="10"
            android:inputType="text"
            android:text=""
            android:textSize="17sp" />
    </TableRow>

    <TableRow
        android:id="@+id/prod_brand"
        android:layout_width="match_parent"
        android:layout_height="match_parent">

        <TextView
            android:id="@+id/prod_brand_label"
            android:layout_width="0dp"
            android:layout_height="wrap_content"
```

```
        android:layout_weight="3"
        android:gravity="end"
        android:text="Brand: "
        android:textSize="17sp" />

    <EditText
        android:id="@+id/prod_brand_val"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_weight="7"
        android:ems="10"
        android:inputType="text"
        android:text=""
        android:textSize="17sp" />
</TableRow>

<TableRow
    android:id="@+id/prod_desc"
    android:layout_width="match_parent"
    android:layout_height="match_parent">

    <TextView
        android:id="@+id/prod_desc_label"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_weight="3"
        android:gravity="end"
        android:text="Description: "
        android:textSize="17sp" />

    <EditText
        android:id="@+id/prod_desc_val"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_weight="7"
        android:ems="10"
        android:inputType="text"
        android:text=""
        android:textSize="17sp" />
</TableRow>

<TableRow
    android:id="@+id/prod_price"
    android:layout_width="match_parent"
    android:layout_height="match_parent">
```

```
<TextView
    android:id="@+id/prod_price_label"
    android:layout_width="0dp"
    android:layout_height="wrap_content"
    android:layout_weight="3"
    android:gravity="end"
    android:text="Price: "
    android:textSize="17sp" />

<EditText
    android:id="@+id/prod_price_val"
    android:layout_width="0dp"
    android:layout_height="wrap_content"
    android:layout_weight="7"
    android:ems="10"
    android:inputType="text"
    android:text=""
    android:textSize="17sp" />
</TableRow>

<TableRow
    android:id="@+id/submit_row"
    android:layout_width="match_parent"
    android:layout_height="match_parent">

    <Button
        android:id="@+id/submit_btn"
        android:layout_width="380dp"
        android:layout_height="wrap_content"
        android:layout_centerInParent="true"
        android:layout_margin="10dp"
        android:gravity="center_horizontal"
        android:padding="10dp"
        android:text="ENTER" />
</TableRow>
</TableLayout>

</LinearLayout>
</androidx.constraintlayout.widget.ConstraintLayout>

//activity_retrieve.xml

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
```

```
xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent">>

    <LinearLayout
        android:layout_width="409dp"
        android:layout_height="729dp"
        android:orientation="vertical"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent">

        <TableLayout
            android:layout_width="wrap_content"
            android:layout_height="729dp"
            android:layout_margin="5dp"
            android:shrinkColumns="*"
            android:stretchColumns="*">>

            <TableRow
                android:id="@+id/title_row"
                android:layout_width="match_parent"
                android:layout_height="match_parent">

                <TextView
                    android:id="@+id/insert_title"
                    android:layout_width="match_parent"
                    android:layout_height="wrap_content"
                    android:layout_centerInParent="true"
                    android:layout_margin="20dp"
                    android:gravity="center_horizontal"
                    android:padding="10dp"
                    android:text="Product Details"
                    android:textColor="@color/black"
                    android:textSize="30sp"
                    android:textStyle="bold" />
            
```

```
        android:id="@+id/prod_name_label"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_weight="3"
        android:gravity="end"
        android:text="Name: "
        android:textSize="17sp" />

    <EditText
        android:id="@+id/prod_name_val"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_weight="7"
        android:ems="10"
        android:inputType="text"
        android:textSize="17sp" />
</TableRow>

<TableRow
    android:id="@+id/prod_brand"
    android:layout_width="match_parent"
    android:layout_height="match_parent">

    <TextView
        android:id="@+id/prod_brand_label"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_weight="3"
        android:gravity="end"
        android:text="Brand: "
        android:textSize="17sp" />

    <EditText
        android:id="@+id/prod_brand_val"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_weight="7"
        android:ems="10"
        android:inputType="text"
        android:text=""
        android:textSize="17sp" />
</TableRow>

<TableRow
    android:id="@+id/prod_desc"
    android:layout_width="match_parent"
```

```
        android:layout_height="match_parent">

        <TextView
            android:id="@+id/prod_desc_label"
            android:layout_width="0dp"
            android:layout_height="wrap_content"
            android:layout_weight="3"
            android:gravity="end"
            android:text="Description: "
            android:textSize="17sp" />

        <EditText
            android:id="@+id/prod_desc_val"
            android:layout_width="0dp"
            android:layout_height="wrap_content"
            android:layout_weight="7"
            android:ems="10"
            android:inputType="text"
            android:text=""
            android:textSize="17sp" />
    </TableRow>

    <TableRow
        android:id="@+id/prod_price"
        android:layout_width="match_parent"
        android:layout_height="match_parent">

        <TextView
            android:id="@+id/prod_price_label"
            android:layout_width="0dp"
            android:layout_height="wrap_content"
            android:layout_weight="3"
            android:gravity="end"
            android:text="Price: "
            android:textSize="17sp" />

        <EditText
            android:id="@+id/prod_price_val"
            android:layout_width="0dp"
            android:layout_height="wrap_content"
            android:layout_weight="7"
            android:ems="10"
            android:inputType="text"
            android:text=""
            android:textSize="17sp" />
    </TableRow>
```

```
</TableLayout>

</LinearLayout>
</androidx.constraintlayout.widget.ConstraintLayout>

//activity_view_prod.xml

<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".RetrieveAllActivity">

    <!--recycler view for displaying our courses-->
    <androidx.recyclerview.widget.RecyclerView
        android:id="@+id/idRVProducts"
        android:layout_width="match_parent"
        android:layout_height="match_parent" />

</RelativeLayout>

//MainActivity.java
package com.sem7.lab.exercise4;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;

public class MainActivity extends AppCompatActivity {

    Button insert_btn, update_btn, delete_btn, retrieve_btn, retrieveAll_btn;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        insert_btn = (Button) findViewById(R.id.insert_btn);
        update_btn = (Button) findViewById(R.id.update_btn);
```

```
delete_btn = (Button) findViewById(R.id.delete_btn);
retrieve_btn = (Button) findViewById(R.id.retrieve_btn);
retrieveAll_btn = (Button) findViewById(R.id.retrieveAll_btn);

insert_btn.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        openInsertActivity();
    }
});

update_btn.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) { openUpdateActivity(); }
});

delete_btn.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        openDeleteActivity();
    }
});

retrieve_btn.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        openRetrieveActivity();
    }
});

retrieveAll_btn.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        openRetrieveAllActivity();
    }
});

public void openInsertActivity(){
    Intent intent = new Intent(this, InsertActivity.class);
    startActivity(intent);
}

public void openUpdateActivity(){
    Intent intent = new Intent(this, UpdateActivity.class);
    startActivity(intent);
}
```

```
}

public void openDeleteActivity(){
    Intent intent = new Intent(this, DeleteActivity.class);
    startActivity(intent);
}

public void openRetrieveActivity(){
    Intent intent = new Intent(this, RetrieveActivity.class);
    startActivity(intent);
}

public void openRetrieveAllActivity(){
    Intent intent = new Intent(this, RetrieveAllActivity.class);
    startActivity(intent);
}
}

//DBHandler.java

package com.sem7.lab.exercise4;

import android.content.ContentValues;
import android.content.Context;
import android.database.Cursor;
import android.database.sqlite.SQLiteDatabase;
import android.database.sqlite.SQLiteOpenHelper;

import java.util.ArrayList;

public class DBHandler extends SQLiteOpenHelper {

    private static final String DB_NAME = "product_info";
    // below int is our database version
    private static final int DB_VERSION = 1;
    private static final String TABLE_NAME = "product_details";
    private static final String ID_COL = "id";
    private static final String NAME_COL = "name";
    private static final String BRAND_COL = "brand";
    private static final String DESCRIPTION_COL = "description";
    private static final String PRICE_COL = "price";

    // creating a constructor for our database handler.
    public DBHandler(Context context) {
        super(context, DB_NAME, null, DB_VERSION);
    }
}
```

```
// below method is for creating a database by running a sqlite query
@Override
public void onCreate(SQLiteDatabase db) {
    // on below line we are creating an sqlite query and we are
    // setting our column names along with their data types.
    String query = "CREATE TABLE " + TABLE_NAME + "("
        + ID_COL + " INTEGER PRIMARY KEY AUTOINCREMENT, "
        + NAME_COL + " TEXT,"
        + BRAND_COL + " TEXT,"
        + DESCRIPTION_COL + " TEXT,"
        + PRICE_COL + " TEXT)";

    // at last we are calling a exec sql method to execute above sql query
    db.execSQL(query);
}

// this method is use to add new course to our sqlite database.
public void insertNewProduct(String prodName, String prodBrand, String
prodDescription, String prodPrice) {

    // on below line we are creating a variable for
    // our sqlite database and calling writable method
    // as we are writing data in our database.
    SQLiteDatabase db = this.getWritableDatabase();

    // on below line we are creating a
    // variable for content values.
    ContentValues values = new ContentValues();

    // on below line we are passing all values
    // along with its key and value pair.
    values.put(NAME_COL, prodName);
    values.put(BRAND_COL, prodBrand);
    values.put(DESCRIPTION_COL, prodDescription);
    values.put(PRICE_COL, prodPrice);

    // after adding all values we are passing
    // content values to our table.
    db.insert(TABLE_NAME, null, values);

    // at last we are closing our
    // database after adding database.
    db.close();
}
```

```
public ArrayList<ProductModal> retrieveProduct(String pid) {  
  
    // on below line we are creating a  
    // database for reading our database.  
    SQLiteDatabase db = this.getReadableDatabase();  
  
    // on below line we are creating a cursor with query to  
    // read data from database.  
    Cursor cursorProducts  
        = db.rawQuery("SELECT * FROM " + TABLE_NAME + " WHERE " + ID_COL +  
"=" + pid, null);  
  
    // on below line we are creating a new array list.  
    ArrayList<ProductModal> productModalArrayList = new ArrayList<>();  
  
    // moving our cursor to first position.  
    if (cursorProducts.moveToFirst()) {  
        do {  
            // on below line we are adding the data from  
            // cursor to our array list.  
            productModalArrayList.add(new ProductModal(  
                cursorProducts.getString(1),  
                cursorProducts.getString(2),  
                cursorProducts.getString(3),  
                cursorProducts.getString(4)));  
        } while (cursorProducts.moveToNext());  
        // moving our cursor to next.  
    }  
    // at last closing our cursor  
    // and returning our array list.  
    cursorProducts.close();  
    System.out.println(productModalArrayList);  
    return productModalArrayList;  
}  
  
public ArrayList<ProductModal> retrieveAllProducts() {  
  
    // on below line we are creating a  
    // database for reading our database.  
    SQLiteDatabase db = this.getReadableDatabase();  
  
    // on below line we are creating a cursor with query to  
    // read data from database.  
    Cursor cursorProducts  
        = db.rawQuery("SELECT * FROM " + TABLE_NAME, null);
```

```
// on below line we are creating a new array list.  
ArrayList<ProductModal> productModalArrayList = new ArrayList<>();  
  
// moving our cursor to first position.  
if (cursorProducts.moveToFirst()) {  
    do {  
        // on below line we are adding the data from  
        // cursor to our array list.  
        productModalArrayList.add(new ProductModal(  
            cursorProducts.getString(1),  
            cursorProducts.getString(2),  
            cursorProducts.getString(3),  
            cursorProducts.getString(4)));  
    } while (cursorProducts.moveToNext());  
    // moving our cursor to next.  
}  
// at last closing our cursor  
// and returning our array list.  
cursorProducts.close();  
System.out.println(productModalArrayList);  
return productModalArrayList;  
}  
  
@Override  
public void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion) {  
    // this method is called to check if the table exists already.  
    db.execSQL("DROP TABLE IF EXISTS " + TABLE_NAME);  
    onCreate(db);  
}  
}  
  
//ProductModal.java  
  
package com.sem7.lab.exercise4;  
  
public class ProductModal {  
    private String prodName;  
    private String prodBrand;  
    private String prodDescription;  
    private String prodPrice;  
    private int id;  
  
    // creating getter and setter methods  
    public String getProdName() { return prodName; }  
    public void setProdName(String prodName) { this.prodName = prodName; }
```

```
public String getProdBrand() { return prodBrand; }
public void setProdBrand(String prodBrand) { this.prodBrand = prodBrand; }

public String getProdDescription() { return prodDescription; }
public void setProdDescription(String prodDescription) { this.prodDescription = prodDescription; }

public String getProdPrice() { return prodPrice; }
public void setProdPrice(String prodPrice) { this.prodPrice = prodPrice; }

public int getId() { return id; }
public void setId(int id) { this.id = id; }

// constructor
public ProductModal(String prodName,
                     String prodBrand,
                     String prodDescription,
                     String prodPrice)
{
    this.prodName = prodName;
    this.prodBrand = prodBrand;
    this.prodDescription = prodDescription;
    this.prodPrice = prodPrice;
}
}

//ProductRVAdapter.java

package com.sem7.lab.exercise4;

import android.content.Context;
import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;
import android.widget.TextView;

import androidx.annotation.NonNull;
import androidx.recyclerview.widget.RecyclerView;

import java.util.ArrayList;

public class ProductRVAdapter extends
RecyclerView.Adapter<ProductRVAdapter.ViewHolder> {

    // variable for our array list and context
```

```
private ArrayList<ProductModal> productModalArrayList;
private Context context;

// constructor
public ProductRVAdapter(ArrayList<ProductModal> productModalArrayList, Context
context) {
    this.productModalArrayList = productModalArrayList;
    this.context = context;
}

@NonNull
@Override
public ViewHolder onCreateViewHolder(@NonNull ViewGroup parent, int viewType) {
    // on below line we are inflating our layout
    // file for our recycler view items.
    View view =
LayoutInflater.from(parent.getContext()).inflate(R.layout.activity_retrieve,
parent, false);
    return new ViewHolder(view);
}

@Override
public void onBindViewHolder(@NonNull ViewHolder holder, int position) {
    // on below line we are setting data
    // to our views of recycler view item.
    ProductModal modal = productModalArrayList.get(position);
    holder.prodNameTV.setText(modal.getProdName());
    holder.prodBrandTV.setText(modal.getProdBrand());
    holder.prodDescTV.setText(modal.getProdDescription());
    holder.prodPriceTV.setText(modal.getProdPrice());
}

@Override
public int getItemCount() {
    // returning the size of our array list
    return productModalArrayList.size();
}

public class ViewHolder extends RecyclerView.ViewHolder {

    // creating variables for our text views.
    private TextView prodNameTV, prodBrandTV, prodDescTV, prodPriceTV;

    public ViewHolder(@NonNull View itemView) {
        super(itemView);
        // initializing our text views
    }
}
```

```
        prodNameTV = itemView.findViewById(R.id.prod_name_val);
        prodBrandTV = itemView.findViewById(R.id.prod_brand_val);
        prodDescTV = itemView.findViewById(R.id.prod_desc_val);
        prodPriceTV = itemView.findViewById(R.id.prod_price_val);
    }
}
}

//InsertActivity.java

package com.sem7.lab.exercise4;

import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

import androidx.appcompat.app.AppCompatActivity;

public class InsertActivity extends AppCompatActivity {

    EditText prodNameEdt, prodBrandEdt, prodDescEdt, prodPriceEdt;
    Button submitInsertBtn;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_insert);

        MyApplication myApp = (MyApplication) getApplication();
        DBHandler dbHandler = myApp.getDBHandler();

        prodNameEdt = findViewById(R.id.prod_name_val);
        prodBrandEdt = findViewById(R.id.prod_brand_val);
        prodDescEdt = findViewById(R.id.prod_desc_val);
        prodPriceEdt = findViewById(R.id.prod_price_val);
        submitInsertBtn = findViewById(R.id.submit_btn);

        submitInsertBtn.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {

                // below line is to get data from all edit text fields.
                String prodName = prodNameEdt.getText().toString();
                String prodBrand = prodBrandEdt.getText().toString();
            }
        });
    }
}
```

```
String prodDescription = prodDescEdt.getText().toString();
String prodPrice = prodPriceEdt.getText().toString();

        // validating if the text fields are empty or not.
        if (prodName.isEmpty() && prodBrand.isEmpty() &&
prodDescription.isEmpty() && prodPrice.isEmpty()) {
            Toast.makeText(InsertActivity.this, "Please enter all the
product details...", Toast.LENGTH_SHORT).show();
            return;
        }

        // on below line we are calling a method to add new
        // course to sqlite data and pass all our values to it.
        dbHandler.insertNewProduct(prodName, prodBrand, prodDescription,
prodPrice);

        // after adding the data we are displaying a toast message.
        Toast.makeText(InsertActivity.this, "Product has been inserted.",

Toast.LENGTH_SHORT).show();
        prodNameEdt.setText("");
        prodBrandEdt.setText("");
        prodDescEdt.setText("");
        prodPriceEdt.setText("");
    }
});
```

}

```
//RetrieveAllActivity.java
```

```
package com.sem7.lab.exercise4;

import android.os.Bundle;

import androidx.appcompat.app.AppCompatActivity;
import androidx.recyclerview.widget.LinearLayoutManager;
import androidx.recyclerview.widget.RecyclerView;

import java.util.ArrayList;

public class RetrieveAllActivity extends AppCompatActivity {

    ArrayList<ProductModal> productModalArrayList;
    ProductRVAdapter productRVAdapter;
    RecyclerView productsRV;
```

```
@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_view_prod);

    MyApplication myApp = (MyApplication) getApplication();
    DBHandler dbHandler = myApp.getDBHandler();

    // initializing our all variables.
    productModalArrayList = new ArrayList<>();

    // getting our course array
    // list from db handler class.
    productModalArrayList = dbHandler.retrieveAllProducts();

    // on below line passing our array list to our adapter class.
    productRVAdapter = new ProductRVAdapter(productModalArrayList,
RetrieveAllActivity.this);
    productsRV = findViewById(R.id.idRVProducts);

    // setting layout manager for our recycler view.
    LinearLayoutManager linearLayoutManager = new
LinearLayoutManager(RetrieveAllActivity.this, RecyclerView.VERTICAL, false);
    productsRV.setLayoutManager(linearLayoutManager);

    // setting our adapter to recycler view.
    productsRV.setAdapter(productRVAdapter);
}

}

//AndroidManifest.xml

<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools">

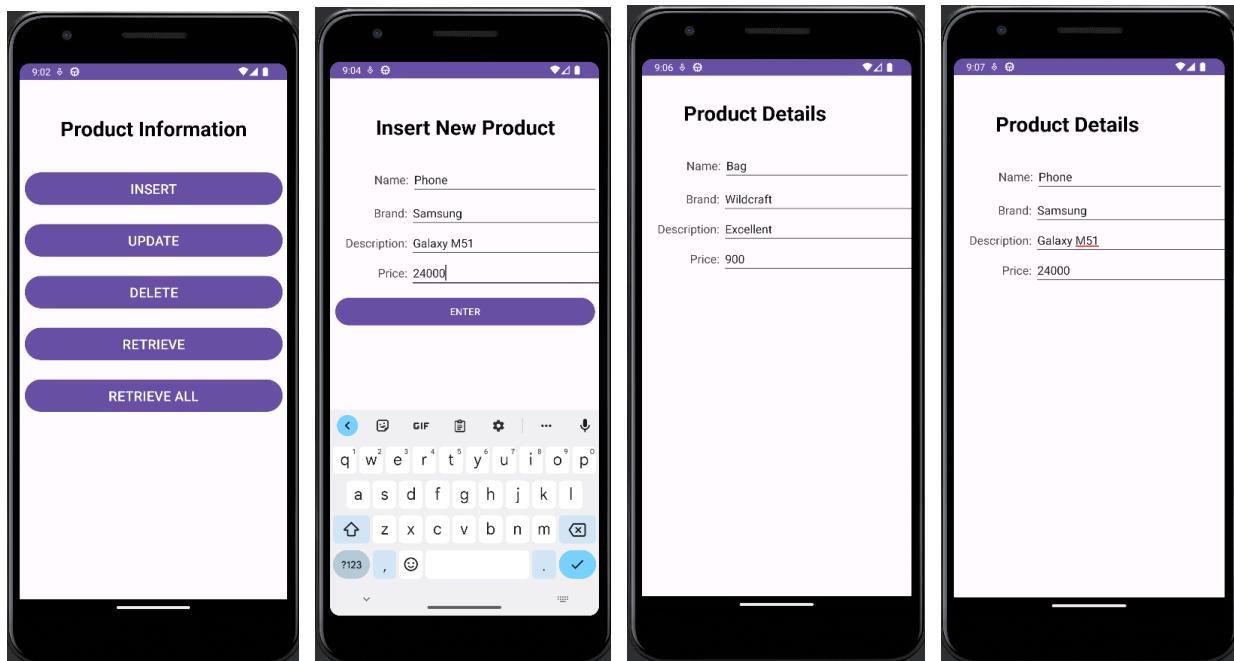
    <application
        android:allowBackup="true"
        android:dataExtractionRules="@xml/data_extraction_rules"
        android:fullBackupContent="@xml/backup_rules"
        android:icon="@mipmap/ic_launcher"
        android:label="@string/app_name"
        android:roundIcon="@mipmap/ic_launcher_round"
        android:supportsRtl="true"
        android:theme="@style/Theme.Exercise4"
```

```
        android:name=".MyApplication"
        tools:targetApi="31"

        <activity android:name=".InsertActivity"></activity>
        <activity android:name=".UpdateActivity"></activity>
        <activity android:name=".DeleteActivity"></activity>
        <activity android:name=".RetrieveActivity"></activity>
        <activity android:name=".RetrieveAllActivity"></activity>
        <activity
            android:name=".MainActivity"
            android:exported="true">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>

</manifest>
```

Output:



Learning outcomes:

- Database operations were implemented in the android app using SQLite.
 - Product details were entered into the database and retrieved.
-

Exercise 5 – Application using Multithreading

Date: 09/11/2023

Aim:

Develop an android application to perform multithreading. Define 3 threads to run concurrently when the “start” button is clicked.

- a) The first thread should change the color of the text indefinitely
- b) The second thread should implement a moving banner
- c) The third thread should display a counter starting from 0 to 1000
- d) When the “Stop” button is pressed all the threads should be stopped
- e) When the “Resume” button is pressed all the threads should resume from the stopped point.

Code:

```
//activity_main.xml
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <Button
        android:id="@+id/startButton"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="84dp"
        android:text="Start"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.492"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/colorChangingText"
        android:layout_width="wrap_content"
```

```
        android:layout_height="wrap_content"
        android:layout_marginTop="100dp"
        android:text="Text Color"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/startButton" />

<TextView
    android:id="@+id/bannerText"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="48dp"
    android:text="I move!"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.498"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/colorChangingText" />

<TextView
    android:id="@+id/counterText"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="56dp"
    android:text="Counter: 0"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.501"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/bannerText" />

<Button
    android:id="@+id/stopButton"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="96dp"
    android:text="Stop"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.498"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/counterText" />

<Button
```

```
        android:id="@+id/resumeButton"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="52dp"
        android:text="Resume"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.501"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/stopButton" />

    </androidx.constraintlayout.widget.ConstraintLayout>

//MainActivity.java
package com.example.app5;

import androidx.annotation.RequiresApi;
import androidx.appcompat.app.AppCompatActivity;

import android.graphics.Color;
import android.os.Build;
import android.os.Bundle;
import android.text.Html;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;

public class MainActivity extends AppCompatActivity {
    private TextView colorChangingText, bannerText, counterText;
    private Button startButton, stopButton, resumeButton;
    private volatile boolean isColorThreadPaused = false;
    private volatile boolean isBannerThreadPaused = false;
    private volatile boolean isCounterThreadPaused = false;

    private boolean isRunning = true;
    private int counter = 0;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
```

```
colorChangingText = findViewById(R.id.colorChangingText);
bannerText = findViewById(R.id.bannerText);
counterText = findViewById(R.id.counterText);
startButton = findViewById(R.id.startButton);
stopButton = findViewById(R.id.stopButton);
resumeButton = findViewById(R.id.resumeButton);

startButton.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        isRunning = true;
        isColorThreadPaused = false;
        isBannerThreadPaused = false;
        isCounterThreadPaused = false;
        startThreads();
    }
});

resumeButton.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        isRunning = true;
        isColorThreadPaused = false;
        isBannerThreadPaused = false;
        isCounterThreadPaused = false;
        startThreads();
    }
});

stopButton.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        isRunning = false;
        isColorThreadPaused = true;
        isBannerThreadPaused = true;
        isCounterThreadPaused = true;
    }
});

private void startThreads(){
```

```
Thread colorChanger = new Thread(new Runnable() {
    final String[] colorNames = {"#FFC3A0", "#FF677D", "#FFD966",
    "#B3E099", "#66B2FF", "#B98BDB"};
    int colorIndex = 0;

    @Override
    public void run() {
        while (isRunning) {
            if (!isColorThreadPaused) {
                final String currentColor = colorNames[colorIndex];
                runOnUiThread(new Runnable() {
                    @RequiresApi(api = Build.VERSION_CODES.N)
                    @Override
                    public void run() {
                        String htmlColor = "<font color='"
                                + currentColor +
                                "'>Text Color</font>";
                        colorChangingText.setText(Html.fromHtml(htmlColor,
                        Html.FROM_HTML_MODE_LEGACY));
                    }
                });
            }

            // Cycle through the colors
            colorIndex = (colorIndex + 1) % colorNames.length;
        }
        try {
            Thread.sleep(1000);
        } catch (InterruptedException e) {
            Thread.currentThread().interrupt();
        }
    }
});

Thread bannerMover = new Thread(new Runnable() {
    @Override
    public void run() {
        TextView bannerText = findViewById(R.id.bannerText);
        final int bannerWidth = bannerText.getWidth();
        final int animationDistance = bannerWidth -
        bannerText.getPaddingEnd();
        int direction = 1;
```

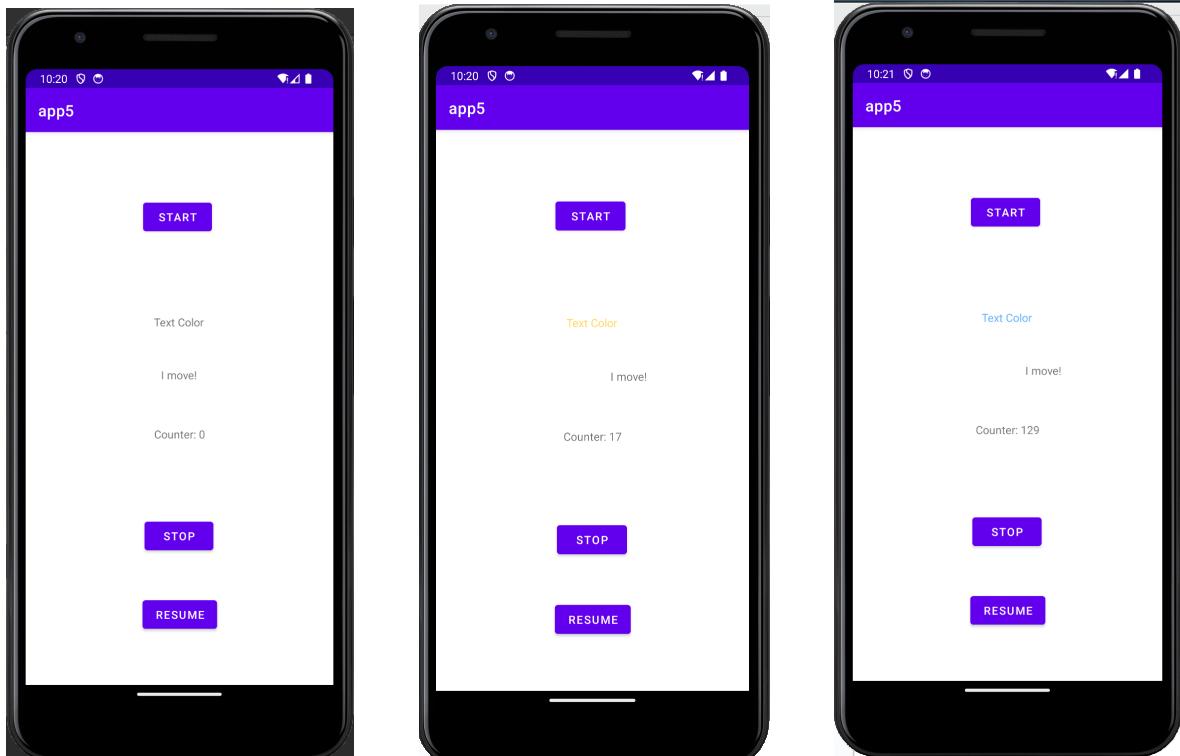
```
        while (isRunning){
            if (!isBannerThreadPaused) {
                int finalDirection = direction;
                runOnUiThread(new Runnable() {
                    @Override
                    public void run() {
                        if (finalDirection == 1) {
                            // Move the bannerText to the right
                            bannerText.animate().translationX(animationDistance);
                        } else {
                            // Move the bannerText back to the left
                            bannerText.animate().translationX(0);
                        }
                    }
                });
            }
            try {
                Thread.sleep(1000);
            }
            catch (InterruptedException e ){
                Thread.currentThread().interrupt();
            }
            direction *= -1;
        }
    });
}

Thread threadCounter = new Thread(new Runnable() {
    @Override
    public void run() {

        while (isRunning && counter<1000){
            if (!isCounterThreadPaused) {
                final int currentCounter = counter;
                runOnUiThread(new Runnable() {
                    @Override
                    public void run() {
                        counterText.setText("Counter: " + currentCounter);
                    }
                });
                counter++;
            }
        }
    }
});
```

```
        }
        try {
            Thread.sleep(1000); // Sleep for 1 second
        } catch (InterruptedException e) {
            Thread.currentThread().interrupt();
        }
    }
});  
  
colorChanger.start();
bannerMover.start();
threadCounter.start();
}  
}
```

Output:



Learning outcomes:

- An android app with multiple features was designed and implemented.
 - Multithreading was implemented in the Java code.
-

Exercise 6 – Finding Geo-coordinates of a Location and Reverse Geocoding

Date: 09/11/2023

Aim:

a) Develop an android application to find the latitude and longitude of current location and the selected location in a google map using anyone of the below options:

- 1) Location Manager
- 2) Network Provider
- 3) GPS Provider

b) Also perform Reverse Geocoding i.e. given a latitude and longitude of a location, app should display the location name or given a location name it should display the latitude and longitude of that place.

Code:

```
//activity_main.xml
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:padding="16dp"
    tools:context=".MainActivity">

    <!-- Previous UI elements -->
    <Button
        android:id="@+id/getLocationButton"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_centerHorizontal="true"
        android:text="Get Location" />

    <TextView
        android:id="@+id/latitudeTextView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@+id/getLocationButton"
```

```
        android:layout_centerHorizontal="true"
        android:layout_marginTop="16dp"
        android:text="Latitude: "
        android:textSize="18sp" />

<TextView
    android:id="@+id/longitudeTextView"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/latitudeTextView"
    android:layout_centerHorizontal="true"
    android:layout_marginTop="8dp"
    android:text="Longitude: "
    android:textSize="18sp" />

<!-- New UI elements for search -->
<EditText
    android:id="@+id/locationNameEditText"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_below="@+id/longitudeTextView"
    android:layout_marginTop="16dp"
    android:hint="Enter Location Name" />

<Button
    android:id="@+id/searchLocationButton"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/locationNameEditText"
    android:layout_centerHorizontal="true"
    android:layout_marginTop="16dp"
    android:text="Search Location" />

<TextView
    android:id="@+id/searchLatitudeTextView"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/searchLocationButton"
    android:layout_centerHorizontal="true"
    android:layout_marginTop="16dp"
    android:text="Searched Latitude: "
    android:textSize="18sp" />
```

```
<TextView
    android:id="@+id/searchLongitudeTextView"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/searchLatitudeTextView"
    android:layout_centerHorizontal="true"
    android:layout_marginTop="8dp"
    android:text="Searched Longitude: "
    android:textSize="18sp" />

</RelativeLayout>

//MainActivity.java
package com.example.app6;

import android.content.pm.PackageManager;
import android.location.Address;
import android.location.Geocoder;
import android.location.Location;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.TextView;
import android.widget.Toast;
import androidx.annotation.NonNull;
import androidx.appcompat.app.AppCompatActivity;
import androidx.core.app.ActivityCompat;
import androidx.core.content.ContextCompat;

import com.example.app6.R;
import com.google.android.gms.location.FusedLocationProviderClient;
import com.google.android.gms.location.LocationServices;
import com.google.android.gms.tasks.OnSuccessListener;
import java.io.IOException;
import java.util.List;
import java.util.Locale;
public class MainActivity extends AppCompatActivity {

    private static final int LOCATION_PERMISSION_REQUEST = 1;
    private FusedLocationProviderClient fusedLocationProviderClient;
```

```
private EditText locationNameEditText;
private Button searchLocationButton;
private TextView latitudeTextView, longitudeTextView, searchLatitudeTextView,
searchLongitudeTextView;

@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_main);
    fusedLocationProviderClient =
    LocationServices.getFusedLocationProviderClient(this);

    locationNameEditText = findViewById(R.id.locationNameEditText);
    searchLocationButton = findViewById(R.id.searchLocationButton);
    latitudeTextView = findViewById(R.id.latitudeTextView);
    longitudeTextView = findViewById(R.id.longitudeTextView);
    searchLatitudeTextView = findViewById(R.id.searchLatitudeTextView);
    searchLongitudeTextView = findViewById(R.id.searchLongitudeTextView);

    findViewById(R.id.getLocationButton).setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View view) {
        getLocation();
    }
});

searchLocationButton.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View view) {
        searchLocation();
    }
});

private void getLocation() {
    if (ContextCompat.checkSelfPermission(this,
    android.Manifest.permission.ACCESS_FINE_LOCATION) ==
PackageManager.PERMISSION_GRANTED) {
        fusedLocationProviderClient.getLastLocation().addOnSuccessListener(new
OnSuccessListener<Location>() {
```

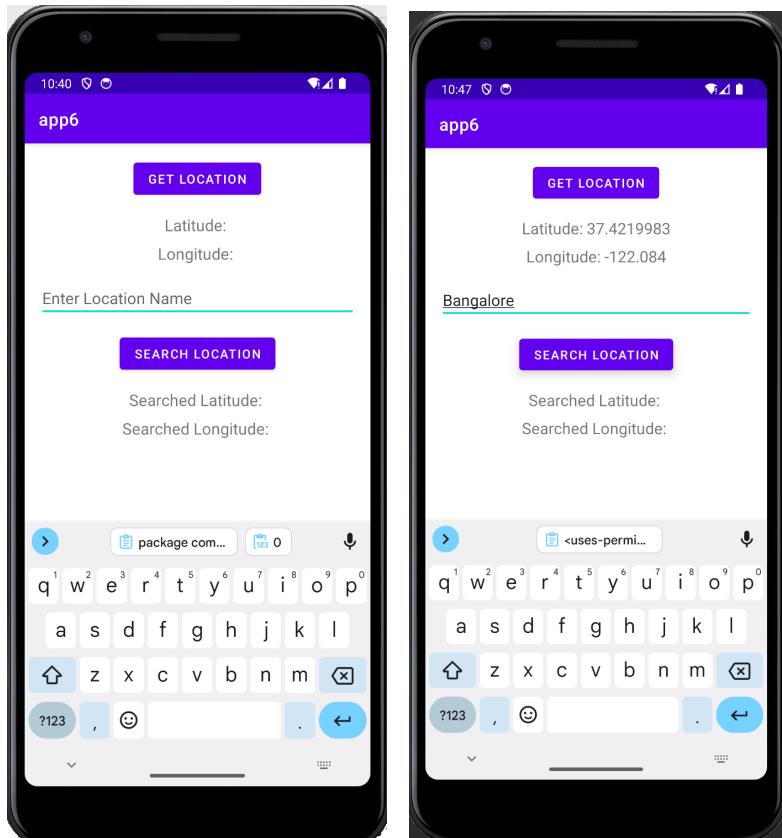
```
    @Override
    public void onSuccess(Location location) {
        if (location != null) {
            double latitude = location.getLatitude();
            double longitude = location.getLongitude();
            latitudeTextView.setText("Latitude: " + latitude);
            longitudeTextView.setText("Longitude: " + longitude);
        } else {
            showToast("Location not available");
        }
    });
} else {
    ActivityCompat.requestPermissions(this, new
String[]{android.Manifest.permission.ACCESS_FINE_LOCATION},
LOCATION_PERMISSION_REQUEST);
}
}

private void searchLocation() {
    String locationName = locationNameEditText.getText().toString().trim();

    if (!locationName.isEmpty()) {
        Geocoder geocoder = new Geocoder(this, Locale.getDefault());
        try {
            List<Address> addresses =
geocoder.getFromLocationName(locationName, 1);
            if (addresses != null && !addresses.isEmpty()) {
                Address address = addresses.get(0);
                double latitude = address.getLatitude();
                double longitude = address.getLongitude();
                searchLatitudeTextView.setText("Searched Latitude: " +
latitude);
                searchLongitudeTextView.setText("Searched Longitude: " +
longitude);
            } else {
                showToast("Location not found");
            }
        } catch (IOException e) {
            e.printStackTrace();
            showToast("Geocoding error");
        }
    } else {
        showToast("Please enter a location name");
    }
}
```

```
@Override  
public void onRequestPermissionsResult(int requestCode, @NonNull String[] permissions, @NonNull int[] grantResults) {  
    super.onRequestPermissionsResult(requestCode, permissions, grantResults);  
    if (requestCode == LOCATION_PERMISSION_REQUEST) {  
        if (grantResults.length > 0 && grantResults[0] ==  
PackageManager.PERMISSION_GRANTED) {  
            getLocation();  
        } else {  
            showToast("Location permission denied");  
        }  
    }  
}  
  
private void showToast(String message) {  
    Toast.makeText(this, message, Toast.LENGTH_SHORT).show();  
}  
}
```

Output:



Learning outcomes:

- An android application to find the latitude and longitude of a selected location was implemented.
 - Geocoding and Reverse geocoding was implemented.
-

Exercise 7 – Writing To and Reading From the SD Card

Date: 09/11/2023

Aim:

Develop an android application to read the text from the SD Card and Write into the SD Card. To perform this, create two TextViews one for writing the text and save the text into the SD Card once submit button is clicked and another one for Displaying the text that is retrieved from the SD Card.

Code:

```
//activity_main.xml

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    tools:context=".MainActivity">
    <TextView
        android:id="@+id/title"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="SD Card App"
        android:textAppearance="@style/TextAppearance.AppCompat.Display1"
        android:textColor="#007565"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.497"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.064" />
    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="36dp"
        android:layout_marginEnd="108dp"
        android:text="Write contents into a file"
```

```
        android:textAppearance="@style/TextAppearance.AppCompat.Medium"
        android:textColor="#00BFA5"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/title" />
    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="80dp"
        android:layout_marginEnd="152dp"
        android:text="File contents:"
        android:textAppearance="@style/TextAppearance.AppCompat.Medium"
        android:textColor="#304FFE"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/title" />
    <TextView
        android:id="@+id/textView3"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="180dp"
        android:layout_marginEnd="256dp"
        android:text="File Name:"
        android:textAppearance="@style/TextAppearance.AppCompat.Medium"
        android:textColor="#304FFE"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/title" />
    <EditText
        android:id="@+id/content"
        android:layout_width="326dp"
        android:layout_height="44dp"
        android:layout_marginTop="16dp"
        android:layout_marginEnd="40dp"
        android:ems="10"
        android:gravity="start|top"
        android:inputType="textMultiLine"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView2" />
    <EditText
        android:id="@+id/filename"
        android:layout_width="163dp"
        android:layout_height="38dp"
        android:layout_marginTop="76dp"
        android:layout_marginEnd="60dp"
        android:ems="10"
        android:gravity="start|top"
        android:inputType="textMultiLine"
```

```
app:layout_constraintEnd_toEndOf="parent"
app:layout_constraintTop_toBottomOf="@+id/textView2" />
<Button
    android:id="@+id/writebtn"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="32dp"
    android:layout_marginEnd="156dp"
    android:backgroundTint="#00BFA5"
    android:text="Write File"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/filename" />
<Button
    android:id="@+id	btnLoad"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="152dp"
    android:layout_marginEnd="136dp"
    android:backgroundTint="#00BFA5"
    android:text="Load From File"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/filename" />
</androidx.constraintlayout.widget.ConstraintLayout>

//activity_read_file.xml

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent" android:layout_height="match_parent"
    tools:context=".ReadFile">
    <EditText
        android:id="@+id/filename2" android:layout_width="163dp"
        android:layout_height="38dp" android:layout_marginTop="28dp"
        android:layout_marginEnd="52dp" android:ems="10" android:gravity="start|top"
        android:inputType="textMultiLine" app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView6" />
    <TextView
        android:id="@+id/textView4" android:layout_width="wrap_content"
        android:layout_height="wrap_content" android:layout_marginTop="40dp"
        android:layout_marginEnd="152dp" android:text="File contents:"
        android:textAppearance="@style/TextAppearance.AppCompat.Medium"
        android:textColor="#304FFE" app:layout_constraintEnd_toEndOf="parent"
```

```
app:layout_constraintTop_toBottomOf="@+id/loadbtn" />
    <TextView
        android:id="@+id/title2" android:layout_width="wrap_content"
        android:layout_height="wrap_content" android:layout_marginTop="44dp"
        android:layout_marginEnd="108dp" android:text="SD Card App"
        android:textAppearance="@style/TextAppearance.AppCompat.Display1"
        android:textColor="#007565" app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toTopOf="parent" />
    <TextView
        android:id="@+id/textView5" android:layout_width="wrap_content"
        android:layout_height="wrap_content" android:layout_marginStart="100dp"

        android:layout_marginTop="28dp"
        android:text="File Name:"
        android:textAppearance="@style/TextAppearance.AppCompat.Medium"
        android:textColor="#304FFE" app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView6" />
    <Button
        android:id="@+id/loadbtn" android:layout_width="wrap_content"
        android:layout_height="wrap_content" android:layout_marginTop="36dp"
        android:layout_marginEnd="148dp" android:backgroundTint="#00BFA5"
        android:text="LOAD FILE" app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/filename2" />
    <TextView
        android:id="@+id/textView6" android:layout_width="wrap_content"
        android:layout_height="wrap_content" android:layout_marginTop="20dp"
        android:layout_marginEnd="104dp" android:text="Read contents From File"
        android:textAppearance="@style/TextAppearance.AppCompat.Medium"
        android:textColor="#00BFA5" app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/title2" />
    <TextView
        android:id="@+id/tvLoad" android:layout_width="283dp"
        android:layout_height="116dp" android:layout_marginTop="32dp"
        android:layout_marginEnd="52dp"
        android:textAppearance="@style/TextAppearance.AppCompat.Body1"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView4" />
</androidx.constraintlayout.widget.ConstraintLayout>
```

```
//MainActivity.java

package com.example.ex7;
import androidx.appcompat.app.AppCompatActivity;
import androidx.core.app.ActivityCompat;
import android.content.DialogInterface;
```

```
import android.content.Intent;
import android.content.pm.PackageManager;
import android.os.Build;
import android.os.Bundle;
import android.os.Environment;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.TextView;
import android.widget.Toast;
import java.io.BufferedReader;
import java.io.File;
import java.io.FileNotFoundException;
import java.io.FileOutputStream;
import java.io.FileReader;
import java.io.IOException;
import java.io.OutputStreamWriter;
public class MainActivity extends AppCompatActivity {
    // Declare the View object references
    Button btnSave, btnLoad;
    EditText content, filenamev;
    TextView tvLoad;
    // Define some String variables, initialized with empty string
    String filepath = "";
    String filename = "";
    String fileContent = "";
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        btnSave = findViewById(R.id.writebtn);
        btnLoad = findViewById(R.id.btnLoad);
        content = findViewById(R.id.content);
        filenamev = findViewById(R.id.filename);
        filepath = "NewDirectory";
        if(!isExternalStorageAvailableForRW()){
            btnSave.setEnabled(false);
        }
        btnSave.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                fileContent = content.getText().toString().trim();
                filename = filenamev.getText().toString().trim();
// Check for Storage Permission
                if(isStoragePermissionGranted()){
                    if(!fileContent.equals("")){
```

```
        File myExternalFile = new
File(getExternalFilesDir(filepath), filename);
        FileOutputStream fos = null;
        try {
            fos = new FileOutputStream(myExternalFile);
            fos.write(fileContent.getBytes());
            fos.close();
        } catch (FileNotFoundException e) {
            e.printStackTrace();
        } catch (IOException e) {
            e.printStackTrace();
        }
        content.setText("");
        filenamev.setText("");
        // Show a Toast message to inform the user that the
operation has been successfully completed.
        Toast.makeText(MainActivity.this, "File saved to SD card.",

Toast.LENGTH_SHORT).show();
    } else{
// If the Text field is empty show corresponding Toast message
        Toast.makeText(MainActivity.this, "Text field can not be
empty.", Toast.LENGTH_SHORT).show();
    }
}
});
btnLoad.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View view) {
        Intent myIntent = new Intent(MainActivity.this, ReadFile.class);
        MainActivity.this.startActivity(myIntent);
    }
});
}
public boolean isStoragePermissionGranted() {
    if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.M) {
        if
(checkSelfPermission(android.Manifest.permission.WRITE_EXTERNAL_STORAGE)
            == PackageManager.PERMISSION_GRANTED) {
//Permission is granted
            return true;
        } else {
//Permission is revoked
            ActivityCompat.requestPermissions(this, new
String[]{android.Manifest.permission.WRITE_EXTERNAL_STORAGE}, 1);
            return false;
        }
    }
}
```

```
        }
    }
    else {
//permission is automatically granted on sdk<23 upon installation
//Permission is granted
        return true;
    }
}
private boolean isExternalStorageAvailableForRW() {
// Check if the external storage is available for read and write by calling
// MEDIA_M/0/UNETnEvDi,ronment.getExternalStorageState() method. If the returned
state is
// then you can read and write files. So, return true in that case, otherwise,
false.
    String extStorageState = Environment.getExternalStorageState();
    if(extStorageState.equals(Environment.MEDIA_MOUNTED)){
        return true;
    }
    return false;
}

//ReadFile.java

package com.example.ex7;
import androidx.appcompat.app.AppCompatActivity;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.TextView;

import java.io.BufferedReader;
import java.io.File;
import java.io.FileNotFoundException;
import java.io.FileReader;
import java.io.IOException;

public class ReadFile extends AppCompatActivity { Button btnLoad;
TextView tvLoad; EditText filenamev; String filename = "";
String filepath = "NewDirectory";

@Override
protected void onCreate(Bundle savedInstanceState) {
```

```
super.onCreate(savedInstanceState); setContentView(R.layout.activity_read_file);

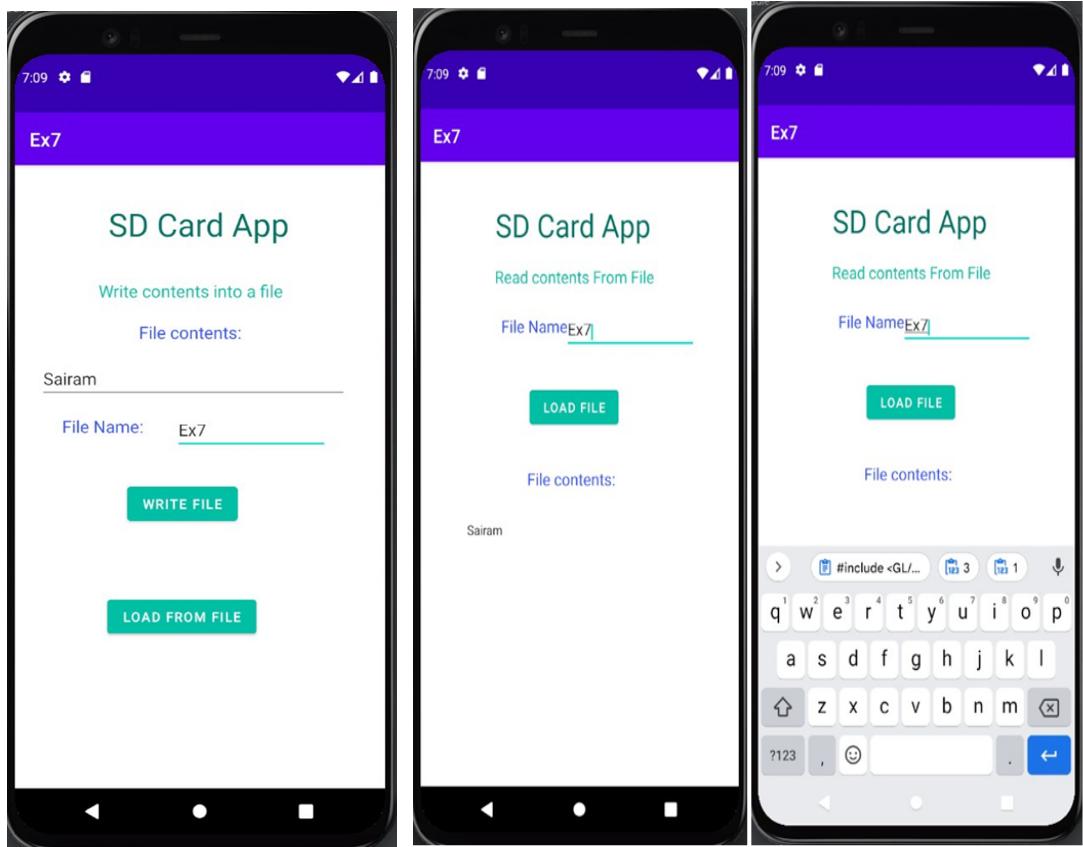
        btnLoad = findViewById(R.id.loadbtn); filenamev =
findViewById(R.id.filename2); tvLoad = findViewById(R.id.tvLoad);

        btnLoad.setOnClickListener(new View.OnClickListener() { @Override
        public void onClick(View view) {
            filename = filenamev.getText().toString().trim();

            FileReader fr = null;
            File myExternalFile = new File(getExternalFilesDir(filepath),
filename);
            StringBuilder stringBuilder = new StringBuilder();
            try {
                fr = new FileReader(myExternalFile); BufferedReader br = new
BufferedReader(fr); String line = br.readLine();

                    while(line != null){ stringBuilder.append(line).append('\n'); line
= br.readLine();
                }
            } catch (FileNotFoundException e) { e.printStackTrace();
            } catch (IOException e) { e.printStackTrace();
            } finally {
                String fileContents = stringBuilder.toString();
                tvLoad.setText(fileContents);
            }
        }
    });
}
```

Output:



Learning outcomes:

- An android application to read and write from the SD card was implemented.
 - Text is saved to and retrieved from the SD card.
-

Exercise 8 – SMS Sending and Notification

Date: 09/11/2023

Aim:

Develop an android app that sends SMS and creates an alert upon receiving the SMS with text in the notification.

Code:

```
//activity_main.xml

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">
    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="SMS App"
        android:textAppearance="@style/TextAppearance.AppCompat.Display1"
        android:textColor="#067A6A"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.096" />
    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="28dp"
        android:layout_marginEnd="140dp"
        android:text="Send an SMS"
        android:textAppearance="@style/TextAppearance.AppCompat.Large"
        android:textColor="#0C675A"
        app:layout_constraintEnd_toEndOf="parent"
```

```
app:layout_constraintTop_toBottomOf="@+id/textView2" />
<TextView
    android:id="@+id/phno"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="44dp"
    android:layout_marginTop="44dp"
    android:text="Phone Number:"
    android:textAppearance="@style/TextAppearance.AppCompat.Medium"
    android:textColor="#304FFE"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView" />
<TextView
    android:id="@+id/smstv"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="44dp"
    android:layout_marginTop="104dp"
    android:text="SMS Content:"
    android:textAppearance="@style/TextAppearance.AppCompat.Medium"
    android:textColor="#304FFE"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView" />
<EditText
    android:id="@+id/etPhone"
    android:layout_width="199dp"
    android:layout_height="39dp"
    android:layout_marginStart="12dp"
    android:layout_marginTop="36dp"
    android:ems="10"
    android:inputType="phone"
    android:textAppearance="@style/TextAppearance.AppCompat.Body1"
    app:layout_constraintStart_toEndOf="@+id/phno"
    app:layout_constraintTop_toBottomOf="@+id/textView" />
<EditText
    android:id="@+id/content"
    android:layout_width="341dp"
    android:layout_height="123dp"
    android:layout_marginTop="68dp"
    android:layout_marginEnd="32dp"
    android:ems="10"
    android:gravity="start|top"
    android:hint="Type here"
    android:inputType="textMultiLine"
    android:textAppearance="@style/TextAppearance.AppCompat.Body1"
    app:layout_constraintEnd_toEndOf="parent"
```

```
app:layout_constraintTop_toBottomOf="@+id/etPhone" />
<Button
    android:id="@+id/sendbtn"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="48dp"
    android:layout_marginEnd="160dp"
    android:backgroundTint="#00BFA5"
    android:text="SEND"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/content" />
</androidx.constraintlayout.widget.ConstraintLayout>
```

```
//MainActivity.java
```

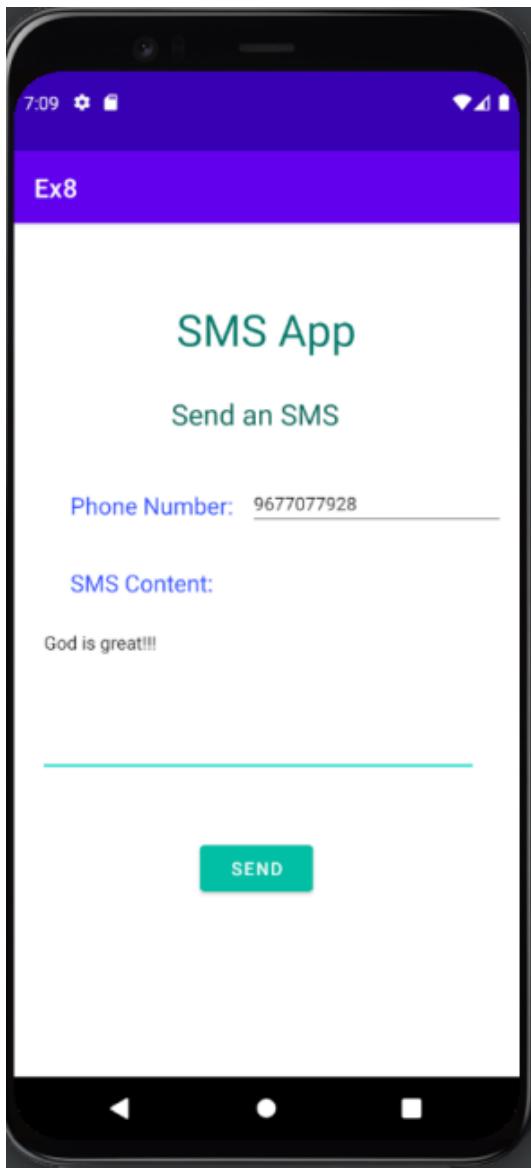
```
package com.example.ex8;
import android.Manifest;
import android.content.pm.PackageManager;
import android.os.Bundle;
import android.telephony.SmsManager;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;
import androidx.appcompat.app.AppCompatActivity;
import androidx.core.app.ActivityCompat;
import androidx.core.content.ContextCompat;
```



```
public class MainActivity extends AppCompatActivity {
    private static final int MY_PERMISSIONS_REQUEST_SEND_SMS = 0;
    Button sendBtn;
    EditText txtphoneNo;
    EditText txtMessage;
    String phoneNo;
    String message;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        sendBtn = (Button) findViewById(R.id.sendbtn);
        txtphoneNo = (EditText) findViewById(R.id.etPhone);
        txtMessage = (EditText) findViewById(R.id.content);
        sendBtn.setOnClickListener(new View.OnClickListener() {
            public void onClick(View view) {
```

```
        sendSMSMessage();
    }
});
}
protected void sendSMSMessage() {
    phoneNo = txtphoneNo.getText().toString();
    message = txtMessage.getText().toString();
    if (ContextCompat.checkSelfPermission(this, Manifest.permission.SEND_SMS)
        != PackageManager.PERMISSION_GRANTED) {
        if (ActivityCompat.shouldShowRequestPermissionRationale(
            this, Manifest.permission.SEND_SMS)) {
        } else {
            ActivityCompat.requestPermissions(this,
                new String[] {Manifest.permission.SEND_SMS},
                MY_PERMISSIONS_REQUEST_SEND_SMS);
        }
    }
}
@Override
public void onRequestPermissionsResult(int requestCode, String permissions[], int[] grantResults)
switch (requestCode) {
    case MY_PERMISSIONS_REQUEST_SEND_SMS: {
        if (grantResults.length > 0
            && grantResults[0] == PackageManager.PERMISSION_GRANTED) {
            SmsManager smsManager = SmsManager.getDefault();
            smsManager.sendTextMessage(phoneNo, null, message, null, null);
            Toast.makeText(getApplicationContext(), "SMS sent.",
Toast.LENGTH_LONG).show();
        }
    } else {
        Toast.makeText(getApplicationContext(), "SMS failed, please try again.",
Toast.LENGTH_LONG).show();
        return;
    }
}
}
}
```

Output:



Learning outcomes:

- An android application to send an SMS was implemented.
- A notification for the SMS was also implemented.

Exercise 9 – Alarm Clock Application

Date: 16/11/2023

Aim:

Develop an alarm clock application for scheduling the task. The application should start an activity to set a new alarm or timer that reminds the user by alerting at the scheduled time. It should also have the option for snooze and stop the alarm.

Code:

```
//activity_main.xml

<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">
    <TimePicker
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:id="@+id/time"
        />
    <ToggleButton
        android:id="@+id/set"
        android:layout_width="150dp"
        android:layout_height="50dp"
        android:layout_below="@+id/time"
        android:layout_marginLeft="130dp"
        />
</RelativeLayout>

//display.xml

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    android:layout_width="match_parent"
    android:layout_height="match_parent">
```

```
<TextView
    android:id="@+id/textView"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Close App to turn off alarm!"
    android:padding="50dp"
    android:textSize="20dp"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent" />
</androidx.constraintlayout.widget.ConstraintLayout>

//MainActivity.java

package com.example.alarm;
import androidx.appcompat.app.AppCompatActivity;
import android.app.AlarmManager;
import android.app.NotificationChannel;
import android.app.NotificationManager;
import android.app.PendingIntent;
import android.content.Intent;
import android.os.Build;
import android.os.Bundle;
import android.text.format.Time;
import android.view.View;
import android.widget.Button;
import android.widget.TimePicker;
import android.widget.Toast;
import android.widget.ToggleButton;
import com.example.alarm.databinding.ActivityMainBinding; import
java.util.Calendar;
public class MainActivity extends AppCompatActivity { private ActivityMainBinding
binding;
@Override
protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
setContentView(R.layout.activity_main);
binding = ActivityMainBinding.inflate(getLayoutInflater());
setContentView(binding.getRoot());
createNotificationChannel();
ToggleButton b1 = findViewById(R.id.set);
TimePicker t1 = findViewById(R.id.time);
t1.setIs24HourView(true);
b1.setOnCheckedChangeListener((buttonView, isChecked) -> {
if (isChecked) {
setAlarm();
```

```
        } else {
            cancelAlarm();
        }
    });
}

private void createNotificationChannel() {
    if(Build.VERSION.SDK_INT >= Build.VERSION_CODES.O) {
        CharSequence name = "alarm";
        String desc = "Channel for alarm";
        int importance = NotificationManager.IMPORTANCE_HIGH;
        NotificationChannel channel = new NotificationChannel("alarm", name, importance);
        channel.setDescription(desc);
        NotificationManager notifs =
            getSystemService(NotificationManager.class);
        notifs.createNotificationChannel(channel);
    }
}

public void setAlarm() {
    TimePicker timePicker = findViewById(R.id.time);
    AlarmManager alarm = (AlarmManager) getSystemService(ALARM_SERVICE);
    Intent intent = new Intent(this, AlarmReceiver.class);
    PendingIntent pendingIntent =
        PendingIntent.getBroadcast(this.getApplicationContext(), 234, intent,
        PendingIntent.FLAG_IMMUTABLE);
    int hour = timePicker.getHour();
    int minute = timePicker.getMinute();
    Calendar calendar = Calendar.getInstance();
    calendar.set(Calendar.HOUR_OF_DAY, hour);
    calendar.set(Calendar.MINUTE, minute);
    calendar.set(Calendar.SECOND, 0);
    long triggerTime = calendar.getTimeInMillis();
    int timeInSec = 1;
    alarm.set(AlarmManager.RTC_WAKEUP, triggerTime, pendingIntent);
    Toast.makeText(this, "Alarm set for " + hour + ":" + minute,
    Toast.LENGTH_SHORT).show();
}

public void cancelAlarm() {
    AlarmManager alarm = (AlarmManager) getSystemService(ALARM_SERVICE);
    Intent intent = new Intent(this, AlarmReceiver.class);
    PendingIntent pendingIntent =
        PendingIntent.getBroadcast(this.getApplicationContext(), 234, intent,
        PendingIntent.FLAG_IMMUTABLE);
    if(alarm != null) {
        alarm.cancel(pendingIntent);
    }
    Toast.makeText(this, "Alarm unset!", Toast.LENGTH_SHORT).show(); }
```

}

```
//AlarmReceiver.java

package com.example.alarm;
import static androidx.core.content.ContextCompat.startActivity;
import android.app.AlarmManager;
import android.app.Notification;
import android.app.NotificationChannel;
import android.app.NotificationManager;
import android.app.PendingIntent;
import android.content.BroadcastReceiver;
import android.content.Context;
import android.content.Intent;
import android.content.pm.PackageManager;
import android.media.Ringtone;
import android.media.RingtoneManager;
import android.net.Uri;
import android.os.Build;
import android.widget.Toast;
import androidx.appcompat.app.AppCompatActivity;
import androidx.core.app.ActivityCompat;
import androidx.core.app.NotificationCompat;
import androidx.core.app.NotificationManagerCompat;
public class AlarmReceiver extends BroadcastReceiver {
    static Uri alarmrt1 =
        RingtoneManager.getDefaultUri(RingtoneManager.TYPE_ALARM);
    @Override
    public void onReceive(Context context, Intent intent) {
        Toast.makeText(context, "INSIDE WOHOOO", Toast.LENGTH_LONG).show();
        Intent i = new Intent(context, In.class);
        i.setFlags(Intent.FLAG_ACTIVITY_NEW_TASK |
        Intent.FLAG_ACTIVITY_CLEAR_TASK);
        PendingIntent p = PendingIntent.getActivity(context, 0, i,
        PendingIntent.FLAG_IMMUTABLE);
        NotificationCompat.Builder builder = new
        NotificationCompat.Builder(context, "alarm")
        .setSmallIcon(R.drawable.ic_launcher_foreground)
        .setContentTitle("Your Alarm is going off!!!")
        .setContentInfo("You set this alarm!")
        .setAutoCancel(true)
        .setDefaults(NotificationCompat.DEFAULT_ALL)
        .setPriority(NotificationCompat.PRIORITY_HIGH)
        .setContentIntent(p);
        NotificationManagerCompat notifications =
            (NotificationManagerCompat) context.getSystemService(Context.NOTIFICATION_SERVICE);
        notifications.notify(1, builder.build());
    }
}
```

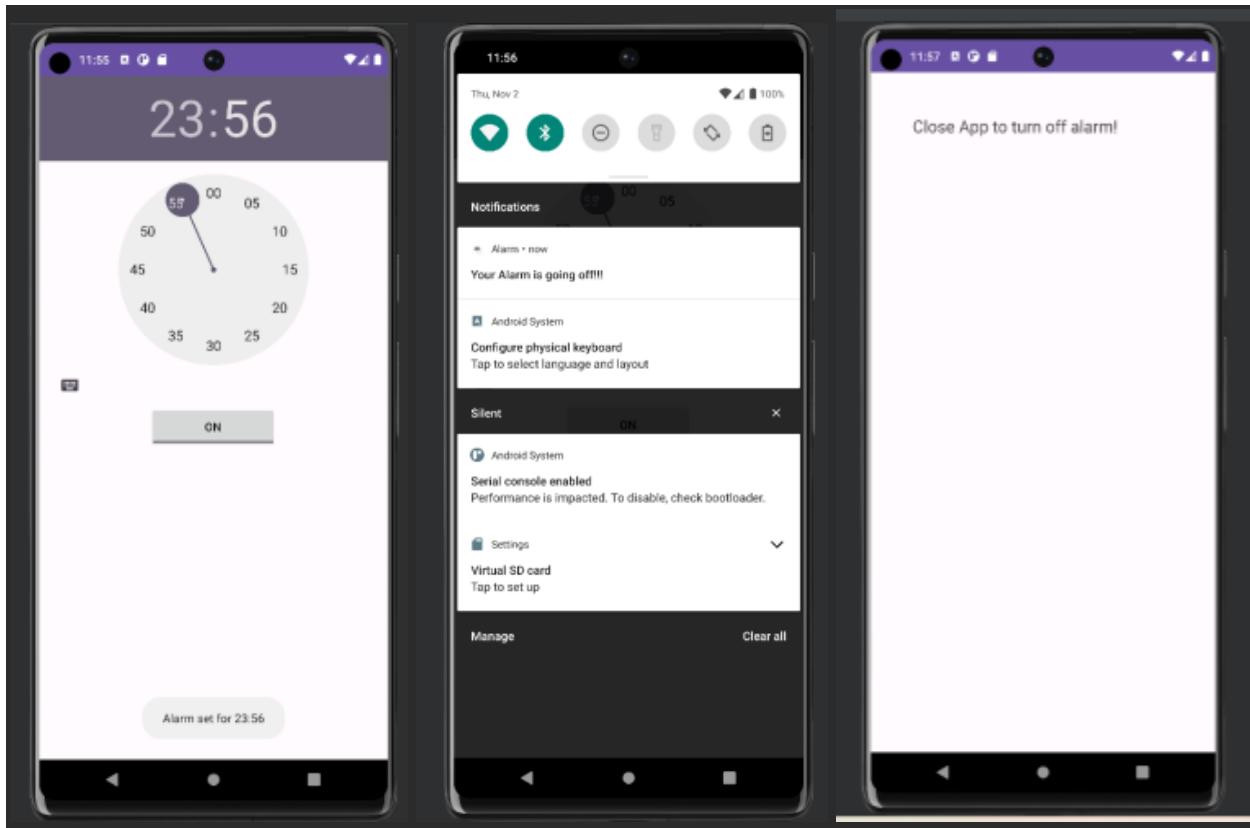
```
NotificationManagerCompat.from(context);
if (ActivityCompat.checkSelfPermission(context,
    android.Manifest.permission.POST_NOTIFICATIONS) != PackageManager.PERMISSION_GRANTED) {
    return;
}
else {
    notifications.notify(123, builder.build());
}
Ringtone ringtone =
RingtoneManager.getRingtone(context.getApplicationContext(), alarmrt1);
//Toast.makeText(context, ringtone.toString(),
Toast.LENGTH_SHORT).show();
intent.putExtra("RINGTONE_URI", alarmrt1);
ringtone.play();
}
public static Uri getInstant() {
return alarmrt1;
}
}

//In.java

package com.example.alarm;
import android.content.Intent;
import android.media.Ringtone;
import android.media.RingtoneManager;
import android.net.Uri;
import android.os.Bundle;
import android.widget.Toast;
//ce3c069
import androidx.appcompat.app.AppCompatActivity;
public class In extends AppCompatActivity {
@Override
protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
setContentView(R.layout.display);
Intent intent = getIntent();
Uri ringtoneUri = intent.getParcelableExtra("RINGTONE_URI"); Ringtone ringtone =
RingtoneManager.getRingtone(In.this, ringtoneUri);
//Toast.makeText(In.this, ringtone.toString(),
Toast.LENGTH_SHORT).show();
if (ringtone.isPlaying()) {
//Toast.makeText(In.this, "yes", Toast.LENGTH_SHORT).show(); ringtone.stop();
}
else {
```

```
//Toast.makeText(In.this, "no", Toast.LENGTH_SHORT).show(); }  
}  
}  
  
//AndroidManifest.java  
  
<?xml version="1.0" encoding="utf-8"?>  
<manifest xmlns:android="http://schemas.android.com/apk/res/android"  
    xmlns:tools="http://schemas.android.com/tools">  
    <uses-permission android:name="android.permission.POST_NOTIFICATIONS" />  
    <uses-permission android:name="android.permission.WAKE_LOCK" /> <uses-permission  
        android:name="android.permission.VIBRATE" />  
    <application  
        android:allowBackup="true"  
        android:dataExtractionRules="@xml/data_extraction_rules"  
        android:fullBackupContent="@xml/backup_rules"  
        android:icon="@mipmap/ic_launcher"  
        android:label="@string/app_name"  
        android:roundIcon="@mipmap/ic_launcher_round"  
        android:supportsRtl="true"  
        android:theme="@style/Theme.Alarm"  
        tools:targetApi="31">  
        <activity  
            android:name=".MainActivity"  
            android:exported="true">  
            <intent-filter>  
                <action android:name="android.intent.action.MAIN" />  
                <category android:name="android.intent.category.LAUNCHER" /> </intent-filter>  
            </activity>  
            <activity android:name=".In"  
                android:exported="false"  
            />  
            <receiver android:name=".AlarmReceiver"  
            />  
        </application>  
    </manifest>
```

Output:



Learning outcomes:

- An android application for an alarm clock was implemented.
- A notification for the alarm set was also implemented.

Exercise 10 – Menu Driven Application

Date: 16/11/2023

Aim:

Develop a Menu driven App that displays the option menu that contains names of different countries and when each of the country is clicked, the description about the country should be displayed.

Code:

```
//activity_main.xml

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <TextView
        android:id="@+id/country"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text=""
        android:textColor="@color/black"
        android:layout_margin="48dp"
        android:padding="24dp"
        android:textSize="24dp"
        android:textStyle="bold"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:padding="24dp"
        android:layout_margin="24dp"
        android:id="@+id/desc"
        android:layout_width="320dp"
```

```
        android:layout_height="wrap_content"
        app:layout_constraintTop_toBottomOf="@+id/country"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent" />

    </androidx.constraintlayout.widget.ConstraintLayout>

//country.xml

<?xml version="1.0" encoding="utf-8"?>
<menu xmlns:android="http://schemas.android.com/apk/res/android">
    <item android:id="@+id/ind"
          android:title="India" />
    <item android:id="@+id/bah"
          android:title="Bahrain" />
    <item android:id="@+id/pak"
          android:title="Pakistan" />
    <item android:id="@+id/is"
          android:title="Israel" />
    <item android:id="@+id/can"
          android:title="Canada" />
    <item android:id="@+id/uk"
          android:title="UK" />
    <item android:id="@+id/chn"
          android:title="China" />
</menu>

//strings.xml

<resources>
    <string name="app_name">Menu Country App</string>
    <string name="india">India, officially the Republic of India (ISO: Bhārat Gaṇarājya), is a country in South Asia. It is the seventh-largest country by area; the most populous country as of June 2023; and from the time of its independence in 1947, the world's most populous democracy</string>
    <string name="pakistan">
        Pakistan (Urdu: پاکستان [pa:k̥ista:n]),[d] officially the Islamic Republic of Pakistan (ISO: اسلامی جمہوریہ پاکستان, islāmi jamhūriyāh pākistān), is a country in South Asia.
    </string>
    <string name="bahrain">
        Bahrain (/ba:'reɪn/bah-RAYN, /'reɪn/; Arabic: البحرين, romanized: al-Baḥrāyn, locally [æl baḥ'ræ:n]), officially the Kingdom of Bahrain,[a] is an island country in West Asia.
    </string>
    <string name="israel">
```

Israel is a country in West Asia. It is bordered by Lebanon to the north, by Syria to the northeast, by Jordan to the east, by the Red Sea to the south, by Egypt to the southwest, by the Mediterranean Sea to the west, and by the Palestinian territories – the West Bank along the east and the Gaza Strip along the southwest. In war please try later

```
</string>
<string name="china">
    China , officially the People\''s Republic of China (PRC),[k] is a country
in East Asia.
</string>
<string name="canada">
    Canada is a country in North America. Its ten provinces and three
territories extend from the Atlantic Ocean to the Pacific Ocean and northward into
the Arctic Ocean, making it the world\''s second-largest country by total area,
</string>
<string name="uk">
The United Kingdom of Great Britain and Northern Ireland, commonly known as the
United Kingdom (UK) or Britain,[k][14] is an island country in Northwestern Europe,
off the north-western coast of the continental mainland.
</string>

</resources>
```

```
//MainActivity.java

package com.example.menucountry;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.view.Menu;
import android.view.MenuInflater;
import android.view.MenuItem;
import android.widget.TextView;

public class MainActivity extends AppCompatActivity {

    TextView country, desc;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
```

```
        country = findViewById(R.id.country);
        desc = findViewById(R.id.desc);
    }
    public boolean onCreateOptionsMenu(Menu menu) {
        MenuInflater inflater = getMenuInflater();
        inflater.inflate(R.menu.country, menu);
        return true;
    }

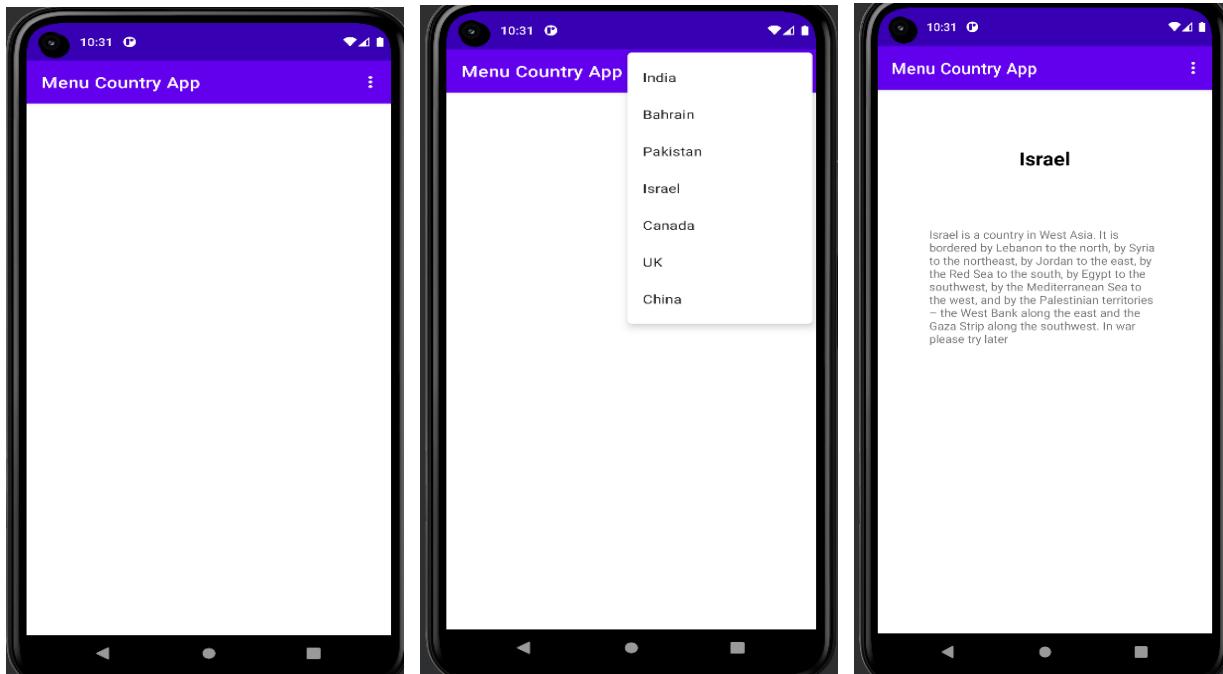
    @Override
    public boolean onOptionsItemSelected(MenuItem item) {
        int id = item.getItemId();
        switch (id){
            case R.id.ind:
                //Toast.makeText(getApplicationContext(),"Item 1 Selected",Toast.LENGTH_LONG).show();
                country.setText("India");
                desc.setText(R.string.india);
                return true;
            case R.id.bah:
                //Toast.makeText(getApplicationContext(),"Item 2 Selected",Toast.LENGTH_LONG).show();
                country.setText("Bahrain");
                desc.setText(R.string.bahrain);
                return true;

            case R.id.pak:
                //Toast.makeText(getApplicationContext(),"Item 3 Selected",Toast.LENGTH_LONG).show();
                country.setText("Pak");
                desc.setText(R.string.pakistan);
                return true;
            case R.id.is:
                //Toast.makeText(getApplicationContext(),"Item 3 Selected",Toast.LENGTH_LONG).show();
                country.setText("Israel");
                desc.setText(R.string.israel);
                return true;
            case R.id.chn:
                //Toast.makeText(getApplicationContext(),"Item 3 Selected",Toast.LENGTH_LONG).show();
                country.setText("China");
                desc.setText(R.string.china);
                return true;
            case R.id.can:
                //Toast.makeText(getApplicationContext(),"Item 3

```

```
Selected",Toast.LENGTH_LONG).show();
        country.setText("Canada");
        desc.setText(R.string.canada);
        return true;
    case R.id.uk:
        Toast.makeText(getApplicationContext(),"Item 3
Selected",Toast.LENGTH_LONG).show();
        country.setText("UK");
        desc.setText(R.string.uk);
        return true;
    default:
        return super.onOptionsItemSelected(item);
    }
}
}
```

Output:



Learning outcomes:

- An android application for a menu-driven application was implemented.
 - Descriptions were provided for the chosen menu options.
-

Exercise 11 – App to Display a Web Page

Date: 16/11/2023

Aim:

Develop an android application to display a static web page with contents that is constructed using formatting tags. Also should load the web page if present in the specified URL.

Code:

```
//activity_main.xml

<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:padding="10dp"
    tools:context=".MainActivity">
    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:orientation="vertical">
        <LinearLayout
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:orientation="horizontal">
            <TextView
                android:id="@+id/textView"
                android:layout_width="60dp"
                android:layout_height="wrap_content"
                android:paddingBottom="10dp"
                android:paddingLeft="15dp"
                android:textStyle="bold"
                android:text="URL:" />
            <EditText
                android:id="@+id/url"
                android:layout_width="237dp"
                android:layout_height="wrap_content"
                android:layout_weight="1"
                android:ems="10"
```

```
        android:inputType="text" />
    <Button
        android:id="@+id/load"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_weight="1"
        android:text="GET" />
</LinearLayout>
<WebView
    android:id="@+id/webView"
    android:layout_width="match_parent"
    android:layout_height="match_parent">
</WebView>
</LinearLayout>
</LinearLayout>

//MainActivity.java

package com.example.webpage;

import androidx.appcompat.app.AppCompatActivity;

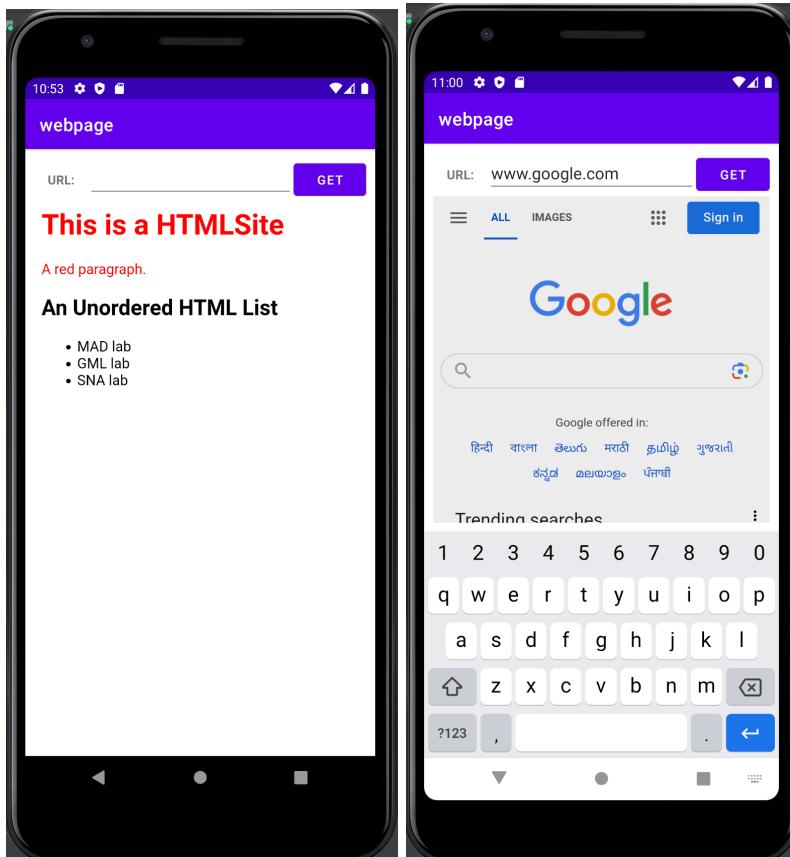
import android.os.Bundle;
import android.view.View;
import android.webkit.WebView;
import android.webkit.WebViewClient;
import android.widget.Button;
import android.widget.EditText;

public class MainActivity extends AppCompatActivity {

    private WebView webView;
    private EditText url;
    private Button getButton;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        webView = findViewById(R.id.webView);
        url = findViewById(R.id.url);
        getButton = findViewById(R.id.load);
        webView.getSettings().setJavaScriptEnabled(true);
    // Load static HTML content
    String staticHtml = "<html>\n" +
        "<body>\n" +
```

```
\n" +\n    "<h1 style=\"color:red; font-family:sans-serif\">"This is a HTML" +\n    "Site</h1>\n" +\n    "\n" +\n    "<p style=\"color:red;\">"A red paragraph.</p>\n" +\n    "\n" +\n    "<h2>An Unordered HTML List</h2>\n" +\n    "\n" +\n    "<ul>\n" +\n    " <li>MAD lab</li>\n" +\n    " <li>GML lab</li>\n" +\n    " <li>SNA lab</li>\n" +\n    "</ul>\n" +\n    "\n" +\n    "</body>\n" +\n    "</html>"\n\nwebView.loadData(staticHtml, "text/html", "UTF-8");\nwebView.setWebViewClient(new WebViewClient()\n{\n    @Override\n    public boolean shouldOverrideUrlLoading(WebView view, String url)\n    {\n        //view.loadUrl(url);\n        System.out.println("hello");\n        return false;\n    }\n});\ngetButton.setOnClickListener(new View.OnClickListener() {\n    @Override\n    public void onClick(View v) {\n        webView.loadUrl("https://" + url.getText().toString());\n    }\n});\n}\n}\n}
```

Output:



Learning outcomes:

- An android application to display a static webpage was implemented.
 - A static webpage was loaded with the specified URL.
-

Exercise 12 – Mini Project

Floppy Jelly - A Game

Team Members

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-

Problem Statement

To create an application that emulates the game Floppy Jelly. The objective of this interactive and dynamic game is to guide a jellyfish through a set of obstacles, in the form of coral reefs and seaweed. Each successive navigation earns the player a point in the game.

Software Requirement

The software requirements for this project include:

1. **Java:** Java is the primary programming language used in the development of this application.
2. **Android Studio:** Android Studio is the Integrated Development Environment (IDE) used for development of the Android game.
3. **LibGDX:** This is a cross-platform Java game development framework based on OpenGL (ES) that works on Windows, Linux, macOS, Android and iOS. It is developed in java and provides tools and APIs for game development, including graphics rendering, input handling as well as physics simulations.

Functional Requirements

1. The game must involve 2 types of objects, a character and an obstacle.
2. On startup, the user must be able to begin the game by tapping on the screen.
3. By default, the character falls under gravity. On tapping, the character is moved in the upward direction.
4. Obstacles spawned in the environment move left at each time step.
5. The objective of the game is to avoid obstacles. For each obstacle avoided, the user gains a point.
6. When the character collides with an obstacle, falls to the ground under gravity, or moves upward out of the screen, the game ends.
7. The user must be able to restart the game on tapping the screen again.

Non-functional Requirements

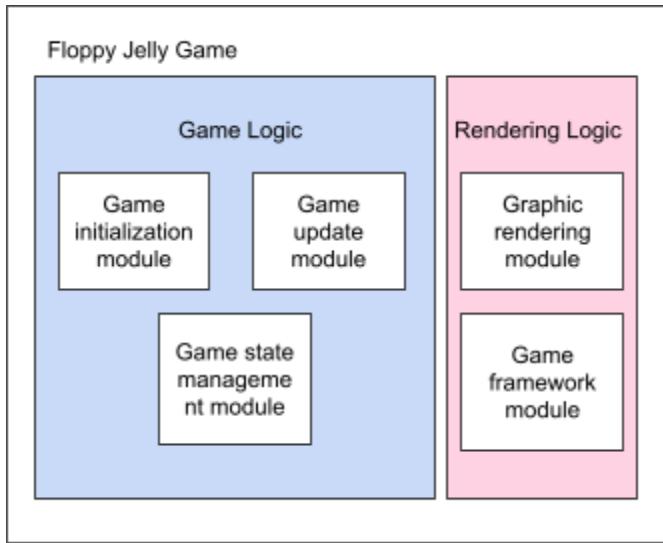
1. Self-explanatory, clean and simple user interface with an appealing design.
2. Challenging and interesting gameplay.
3. Smooth movements and dynamic environments.
4. Lightweight, Offline application with low latency.

Functionalities for each module

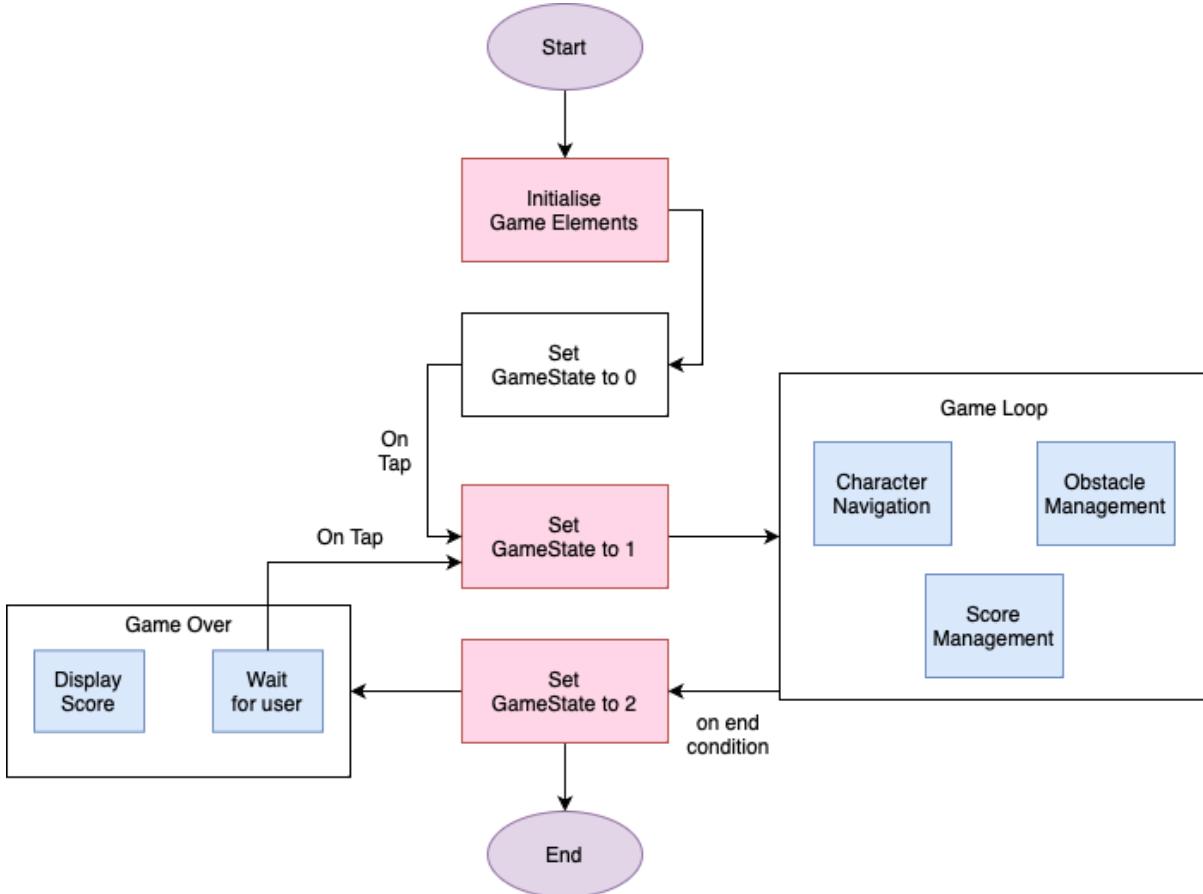
- 1. Game Initialization:**
 - a. Initialize the game state to 0.
 - b. Initialize and Load the background.
 - c. Initialize and Load the character (Jellyfish) and set its position on the screen.
 - d. Initialize and Load the obstacles.
 - e. Initialize the distance between 2 obstacles.
 - f. On tapping, set the game state to 1.
- 2. Character Control:**
 - a. On tap, increase Jellyfish's velocity in the upward direction to navigate.
 - b. Simulate falling motion otherwise by applying gravity.
- 3. Obstacle Generation:**
 - a. Randomly generate the positions of the obstacles in the environment.
 - b. Display the obstacles in the environment.
- 4. Collision Detection:**
 - a. Checks for overlap of jellyfish's bounding circle and the obstacle's rectangle bounding box using LibGDX functionality.
 - b. On detection of collision, transition to the Game Over state.
- 5. Scoring Module:**
 - a. When the character's coordinates exceed that of an obstacle, the user gains a point.
- 6. Game State Management:**
 - a. *Start State (= 0)*: Displays the initial screen if the app just opened, or prompts the user to tap to start the game.
 - b. *Active State (= 1)*: Game is active - Jellyfish control and score incrementation occurs in this state. Transitions to the game-over state, changing the gameState variable to 2, if the jellyfish collides with an obstacle or reaches the screen's bottom.
 - c. *Game Over State (= 2)*: Displays the "Game Over" page, along with the score. Waits for user tap in order to restart the game. On user tap, change the gameState variable to 1 and call the gameStart() method to reset the game parameters.

System Design

Architecture



Process Flow



Code

```
package com.project.floppyjellygame;

import com.badlogic.gdx.ApplicationAdapter;
import com.badlogic.gdx.Gdx;
import com.badlogic.gdx.graphics.Color;
import com.badlogic.gdx.graphics.GL20;
import com.badlogic.gdx.graphics.Texture;
import com.badlogic.gdx.graphics.g2d.BitmapFont;
import com.badlogic.gdx.graphics.g2d.SpriteBatch;
import com.badlogic.gdx.graphics.glutils.ShapeRenderer;
import com.badlogic.gdx.math.Circle;
import com.badlogic.gdx.math.Intersector;
import com.badlogic.gdx.math.Rectangle;
//import com.badlogic.gdx.physics.box2d.CircleShape;

import java.util.Random;

public class FloppyJellyGame extends ApplicationAdapter {
    SpriteBatch batch;
    Texture background;
    Texture[] birds;
    int flapState = 0;
    float birdY;
    int gameState = 0;
    float velocity = 0;
    float gravity = 2;
    Texture topTube;
    Texture bottomTube;
    int numberoftube = 4;
    float gap = 700;
    float[] tubeOffset = new float[numberoftube];
    Random random = new Random();
    float[] tubeX = new float[numberoftube];
    float tubeVelocity = 4;
    float distanceBetweenTubes;

    Texture gameOver;

    int scores = 0;
    int scoringTube = 0;
    BitmapFont bitmapFont;

    ShapeRenderer shapeRenderer;
```

```
Circle circle;

Rectangle[] topTubeRectangle;
Rectangle[] bottomTubeRectangle;

@Override
public void create () {
    batch = new SpriteBatch();
    background = new Texture("background.jpg");
    birds = new Texture[2];
    birds[0] = new Texture("jellyfish9.png");
    birds[1] = new Texture("jellyfish10.png");
    bottomTube = new Texture("coral3.png");
    topTube = new Texture("kelp.png");
    gameOver = new Texture("gameOver.png");

    bitmapFont = new BitmapFont();
    bitmapFont.setColor(Color.WHITE);
    bitmapFont.getData().scale(10);

    shapeRenderer = new ShapeRenderer();
    circle = new Circle();

    topTubeRectangle = new Rectangle[numberOfTube];
    bottomTubeRectangle = new Rectangle[numberOfTube];
    distanceBetweenTubes = (float) (Gdx.graphics.getWidth() / 1.5 );

    birdY = Gdx.graphics.getHeight() / 2 - birds[flapState].getHeight() /
2;

    for (int i = 0 ; i < numberOfTube ; i++) {

        tubeOffset[i] = (random.nextFloat() - 0.5f) *
(Gdx.graphics.getHeight() - gap - 200);

        tubeX[i] = (float) (Gdx.graphics.getWidth() / 2 -
topTube.getWidth() / 2 + Gdx.graphics.getWidth()
+ i * distanceBetweenTubes);

        topTubeRectangle[i] = new Rectangle();
        bottomTubeRectangle[i] = new Rectangle();

    }
}
```

```
}

public void gameStart() {
    birdY = Gdx.graphics.getHeight() / 2 - birds[flapState].getHeight() /
2;

    scoringTube = 0;
    scores = 0;
    velocity = 0;

    for (int i = 0 ; i < numberOfType ; i++) {

        tubeOffset[i] = (random.nextFloat() - 0.5f) *
(Gdx.graphics.getHeight() - gap - 200);

        tubeX[i] = Gdx.graphics.getWidth() / 2 - topTube.getWidth() / 2
+ Gdx.graphics.getWidth()
                + i * distanceBetweenTubes;

        topTubeRectangle[i] = new Rectangle();
        bottomTubeRectangle[i] = new Rectangle();

    }
}

@Override
public void render () {
    batch.begin();
    batch.draw(background,0,0,Gdx.graphics.getWidth() ,
Gdx.graphics.getHeight());

    if (gameState == 1) {

        if (Gdx.input.justTouched()) {

            velocity = -25;
        }

        if (tubeX[scoringTube] < Gdx.graphics.getWidth() / 2) {

            scores++;

            if (scoringTube < numberOfType - 1) {

                scoringTube++;
            }
        }
    }
}
```

```
        } else {

            scoringTube = 0;

        }

    }

    for (int i = 0 ; i < numberOfTube ; i++) {

        if (tubeX[i] < -topTube.getWidth()) {

            tubeX[i] += numberOfTube * distanceBetweenTubes;

        } else {

            tubeX[i] -= tubeVelocity;

        }

        batch.draw(topTube,tubeX[i],
                   Gdx.graphics.getHeight() / 2 + gap / 2 +
tubeOffset[i]);
        batch.draw(bottomTube,tubeX[i],
                   Gdx.graphics.getHeight() / 2 - gap / 2 -
bottomTube.getHeight() + tubeOffset[i]);

        topTubeRectangle[i] = new Rectangle(tubeX[i],
                                             Gdx.graphics.getHeight() / 2 + gap / 2 +
tubeOffset[i],
                                             topTube.getWidth(),
                                             topTube.getHeight());
        bottomTubeRectangle[i] = new Rectangle(tubeX[i],
                                               Gdx.graphics.getHeight() / 2 - gap / 2 -
bottomTube.getHeight() + tubeOffset[i],
                                             bottomTube.getWidth(),
                                             bottomTube.getHeight());
    }

    if (birdY > 0) {
        velocity += gravity;
        birdY -= velocity;
    } else {

        gameState = 2;
    }
}
```

```
    }

    if (flapState == 0) {
        flapState = 1;
    } else {
        flapState = 0;
    }

} else if(gameState == 0) {

    if (Gdx.input.justTouched()) {
        gameState = 1;
    }

} else if (gameState == 2) {

    batch.draw(gameOver,Gdx.graphics.getWidth() / 2 -
gameOver.getWidth() / 2,
            Gdx.graphics.getHeight() / 2 -
gameOver.getHeight() / 2);

    if (Gdx.input.justTouched()) {

        gameState = 1;

        gameStart();

    }

}

batch.draw(birds[flapState],Gdx.graphics.getWidth() / 2 -
birds[flapState].getWidth() / 2 ,
        birdY);

bitmapFont.draw(batch,Integer.toString(scores),200,200);

batch.end();

circle.set(Gdx.graphics.getWidth() / 2
        ,birdY + birds[flapState].getWidth() / 2
        ,birds[flapState].getWidth() / 2);

//shapeRenderer.begin(ShapeRenderer.ShapeType.Filled);
```

```
//shapeRenderer.setColor(Color.RED);
//shapeRenderer.circle(circle.x,circle.y,circle.radius);
for (int i = 0 ; i < numberTube ; i++) {
    /*
        shapeRenderer.rect(tubeX[i],
                            Gdx.graphics.getHeight() / 2 + gap / 2 +
tubeOffset[i],
                            topTube.getWidth(),
                            topTube.getHeight());

        shapeRenderer.rect(tubeX[i],
                            Gdx.graphics.getHeight() / 2 - gap / 2 -
bottomTube.getHeight() + tubeOffset[i],
                            bottomTube.getWidth(),
                            bottomTube.getHeight());
    */
    if (Intersector.overlaps(circle,topTubeRectangle[i])
        ||
Intersector.overlaps(circle,bottomTubeRectangle[i]) ) {

        gameState = 2;

    }

}

shapeRenderer.end();

}

@Override
public void dispose () {
    batch.dispose();

}

}
```

Output Screenshots

