VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELGAUM

MOBILE APLICATION DEVELOPMENT

Subject code: 18CSMP68

STUDENT MANUAL

VI SEMESTER

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Department of Information Science & Engineering

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Assistant Professor
Department of Information Science & Engineering

A J INSTITUTE OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
(A unit of Laxmi Memorial Education Trust. (R))
NH - 66, Kottara Chowki, Kodical Cross, Mangaluru- 575 006

Vision of the Department

To be a center of excellence in Information Science & Engineering education, research and training to meet the growing needs of the industry and society.

Mission of the Department

- To impart theoretical and practical knowledge through the concepts and technologies in Information Science and Engineering
- To foster research, collaboration and higher education with premier institutions and industries.
- Promote innovation and entrepreneurship to fulfill the needs of the society and industry.

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

COURSE OBJECTIVE

This course will enable students to:

- Learn and acquire the art of Android Programming.
- Configure Android studio to run the applications.
- Understand and implement Android's User interface functions.
- Create, modify and query on SQlite database.
- Inspect different methods of sharing data using services.

COURSE OUTCOMES

After studying this course, students will be able to:

- Create, test and debug Android application by setting up Android development environment.
- Implement adaptive, responsive user interfaces that work across a wide range of devices.
- Infer long running tasks and background work in Android applications.
- Demonstrate methods in storing, sharing and retrieving data in Android applications.
- Infer the role of permissions and security for Android applications.

SYLLABUS

MOBILE APPLICATION DEVELOPMENT **(Effective from the academic year 2018 - 2019)** **SEMESTER – VI**			
Course Code	**18CSMP68**	**IA Marks**	40
Number of Contact Hours/Week	0:0:2	**Exam Marks**	60
Total Number of Contact Hours	3 Hours/Week	**Exam Hours**	03
CREDITS – 02			

Laboratory Objectives : This laboratory (18CSMP68) will enable students to

- Learn and acquire the art of Android Programming.
- Configure Android studio to run the applications.
- Understand and implement Android's User interface functions.
- Create, modify and query on SQlite database.
- Inspect different methods of sharing data using services.

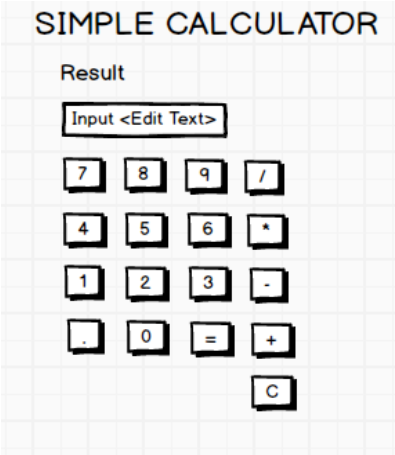
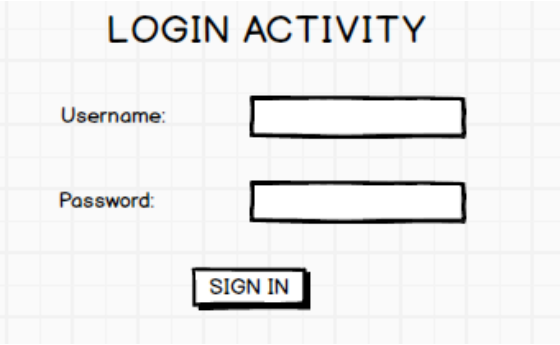
Descriptions (if any):

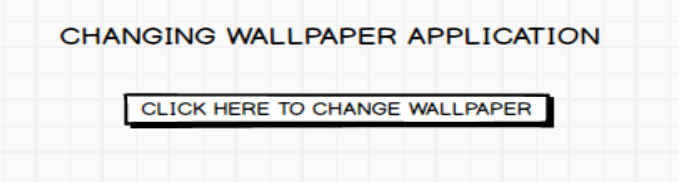
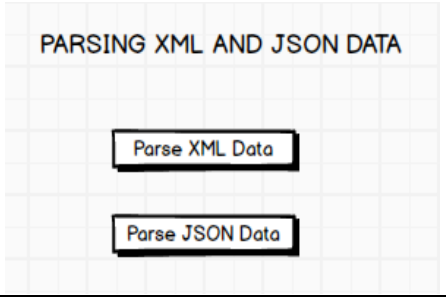
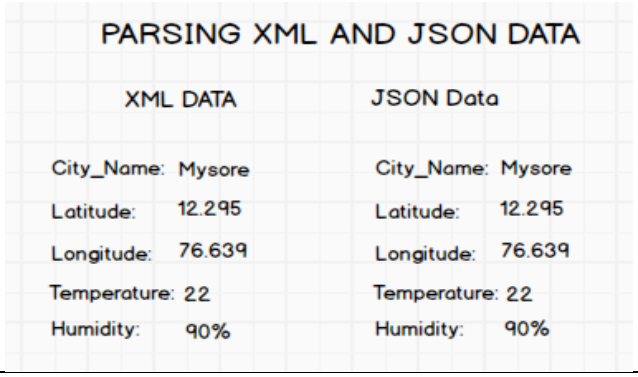
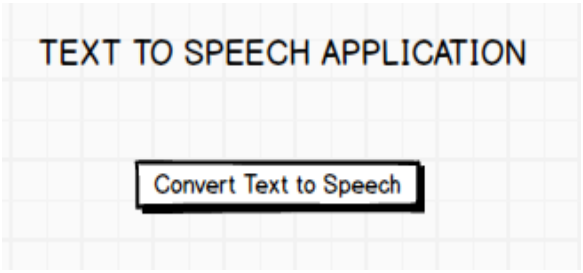
1. The installation procedure of the Android Studio/Java software must be demonstrated and carried out in groups.
2. Students should use the latest version of Android Studio/Java/ Kotlin to execute these programs. Diagrams given are for representational purposes only, students are expected to improvise on them.
3. **Part B programs should be developed as an application and are to be demonstrated as a mini project in a group by adding extra features or the students can also develop their application and demonstrate it as a mini-project. (Projects/programs are not limited to the list given in Part B).**

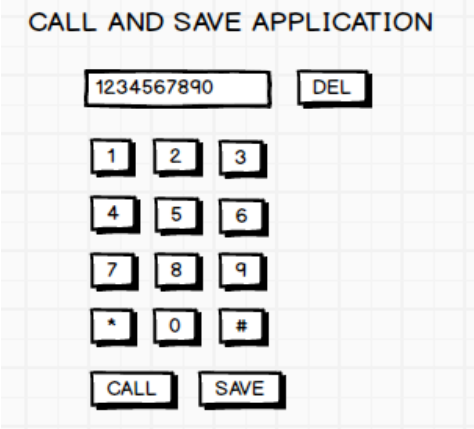
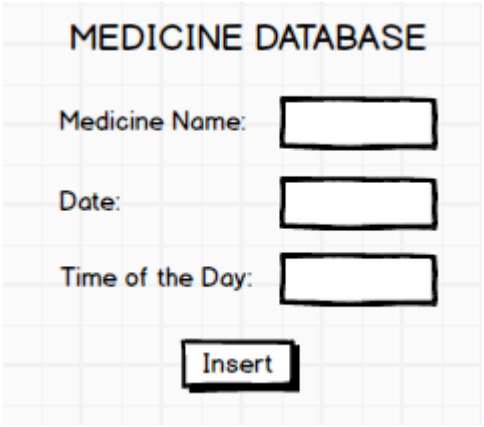
Programs List:

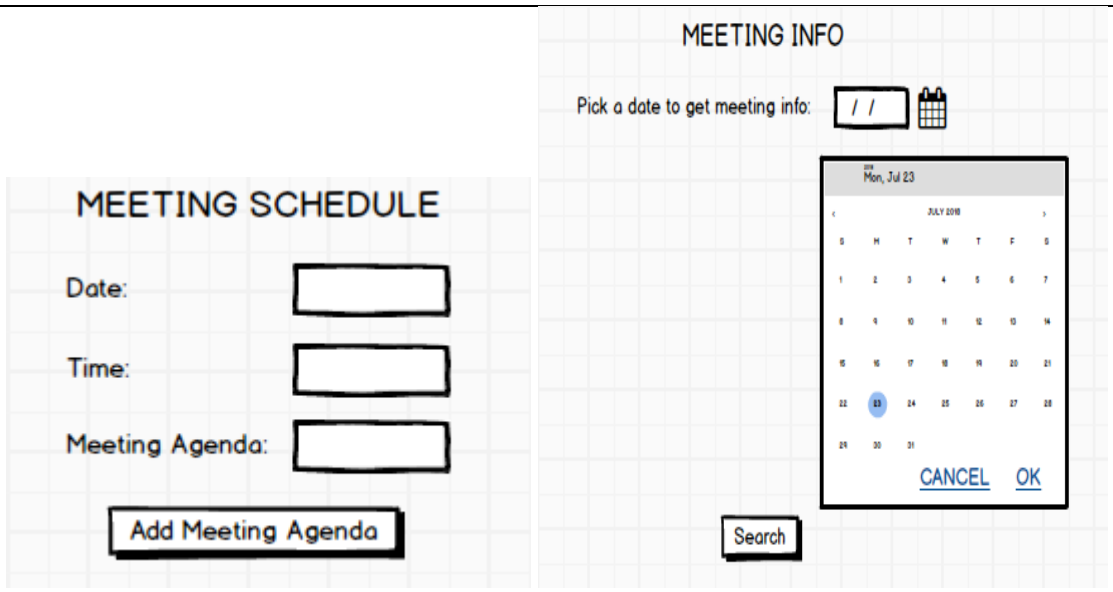
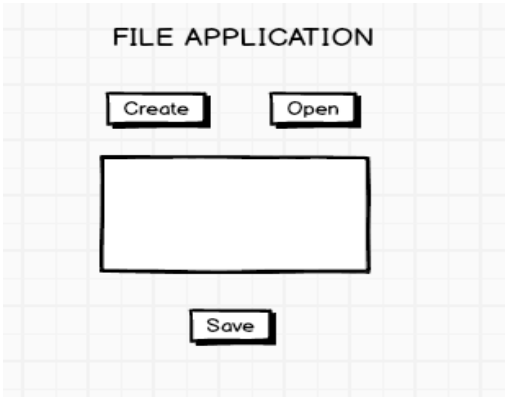
PART – A

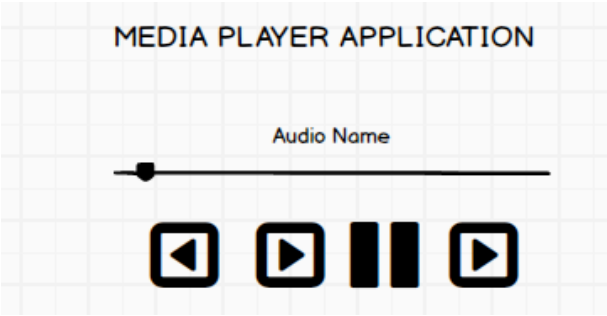
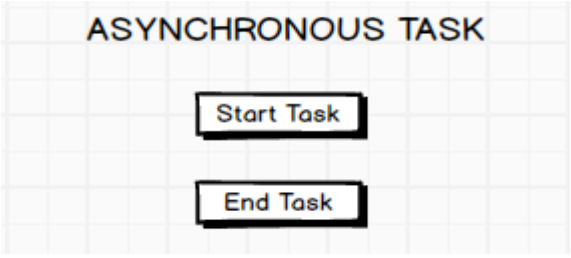
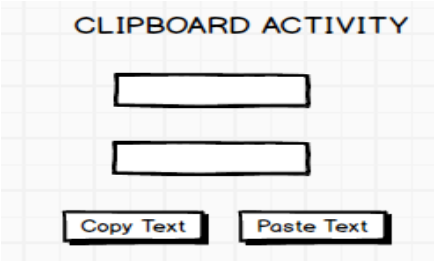
1	Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number. 
2	Develop an Android application using controls like Button, TextView, EditText for

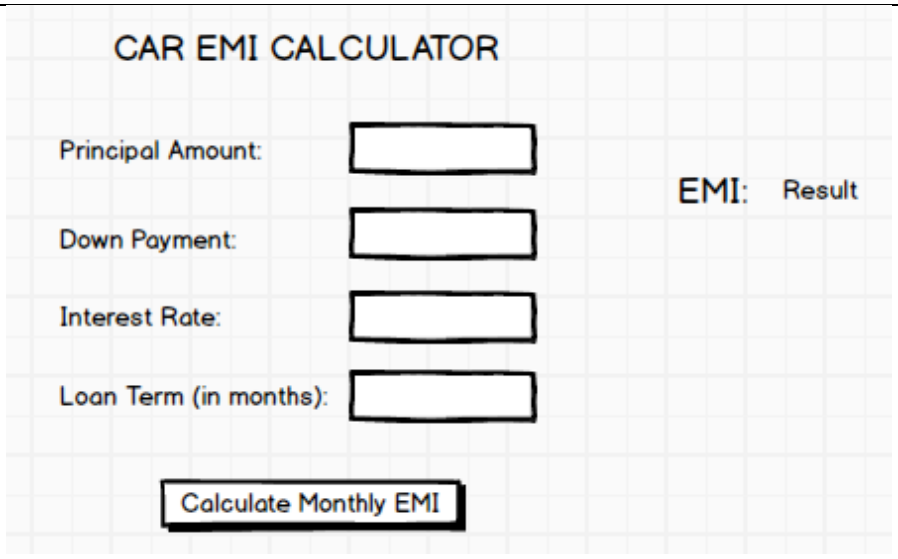
	designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division. 
3	Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules: • Password should contain uppercase and lowercase letters. • Password should contain letters and numbers. • Password should contain special characters. • Minimum length of the password (the default value is 8). On successful **SIGN UP** proceed to the next Login activity. Here the user should **SIGN IN** using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying "Successful Login" or else display a toast message saying "Login Failed". The user is given only two attempts and after that display a toast message saying "Failed Login Attempts" and disable the SIGN IN button. Use Bundle to transfer information from one activity to another.  

4	Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds. 
5	Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a TextViewcontrol. 
6	Create two files of XML and JSON type with values for City_Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.  
7	Develop a simple application with one EditText so that the user can write some text in it. Create a button called "Convert Text to Speech" that converts the user input text into voice. 

8	Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts. 
	PART - B
1	Write a program to enter Medicine Name, Date and Time of the Day as input from the user and store it in the SQLite database. Input for Time of the Day should be either Morning or Afternoon or Evening or Night. Trigger an alarm based on the Date and Time of the Day and display the Medicine Name. 
2	Develop a content provider application with an activity called "Meeting Schedule" which takes Date, Time and Meeting Agenda as input from the user and store this information into the SQLite database. Create another application with an activity called "Meeting Info" having DatePicker control, which on the selection of a date should display the Meeting Agenda information for that particular date, else it should display a toast message saying "No Meeting on this Date".

	
3	Create an application to receive an incoming SMS which is notified to the user. On clicking this SMS notification, the message content and the number should be displayed on the screen. Use appropriate emulator control to send the SMS message to your application. 
4	Write a program to create an activity having a Text box, and also Save, Open and Create buttons. The user has to write some text in the Text box. On pressing the Create button the text should be saved as a text file in MkSDcard. On subsequent changes to the text, the Save button should be pressed to store the latest content to the same file. On pressing the Open button, it should display the contents from the previously stored files in the Text box. If the user tries to save the contents in the Textbox to a file without creating it, then a toast message has to be displayed saying "First Create a File". 

5	Create an application to demonstrate a basic media player that allows the user to Forward, Backward, Play and Pause an audio. Also, make use of the indicator in the seek bar to move the audio forward or backward as required. 
6	Develop an application to demonstrate the use of Asynchronous tasks in android. The asynchronous task should implement the functionality of a simple moving banner. On pressing the Start Task button, the banner message should scroll from right to left. On pressing the Stop Task button, the banner message should stop. Let the banner message be "Demonstration of Asynchronous Task". 
7	Develop an application that makes use of the clipboard framework for copying and pasting of the text. The activity consists of two EditText controls and two Buttons to trigger the copy and paste functionality. 
8	Create an AIDL service that calculates Car Loan EMI. The formula to calculate EMI is E = P * (r(1+r)n)/((1+r)n-1) where E = The EMI payable on the car loan amount P = The Car loan Principal Amount r = The interest rate value computed on a monthly basis n = The loan tenure in the form of months The down payment amount has to be deducted from the principal amount paid towards buying the Car. Develop an application that makes use of this AIDL service to calculate the EMI. This application should have four EditText to read the PrincipalAmount, Down Payment, Interest Rate, Loan Term (in months) and a button named as "Calculate Monthly

	EMI". On click of this button, the result should be shown in a TextView. Also, calculate the EMI by varying the Loan Term and Interest Rate values.
	

Laboratory Outcomes: After studying these laboratory programs, students will be able to

- Create, test and debug Android application by setting up Android development environment.
- Implement adaptive, responsive user interfaces that work across a wide range of devices.
- Infer long running tasks and background work in Android applications.
- Demonstrate methods in storing, sharing and retrieving data in Android applications.
- Infer the role of permissions and security for Android applications.

Procedure to Conduct Practical Examination

- Experiment distribution
  - For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
  - For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Courseed to change in accordance with university regulations)
  - For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15= 100 Marks
  - For laboratories having PART A and PART B
    i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
    ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

Text Books:

1. Google Developer Training, **"Android Developer Fundamentals Course – Concept Reference",** Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals- course-concepts/details

(Download pdf file from the above link)

Reference Books:

1. Erik Hellman, **"Android Programming – Pushing the Limits",** 1st Edition, Wiley India Pvt Ltd, 2014. ISBN-13: 978-8126547197
2. Dawn Griffiths and David Griffiths, **"Head First Android Development",** 1st Edition, O"Reilly SPD Publishers, 2015. ISBN-13: 978-9352131341
3. Bill Phillips, Chris Stewart and Kristin Marsicano, **"Android Programming: The Big Nerd Ranch Guide",** 3rd Edition, Big Nerd Ranch Guides, 2017. ISBN-13: 978-0134706054

PROGRAMS

1. Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number.

Procedure

1. Create a New Android Project with Empty Activity.
2. Open activity_main.xml file from res layout folder.
3. Create layout using nested Relative Layout and TextView.
4. Use horizontal divider to draw the line
5. Use imageview to add the logo
6. Use android:layout_gravity/android:gravity properties to center the components.

Design

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/textView"
        android:layout_width="314dp"
        android:layout_height="54dp"
        android:layout_marginTop="120dp"
        android:layout_marginEnd="32dp"
        android:layout_marginRight="32dp"
        android:gravity="center"
        android:text="HONDA MOTOR CORP"
```

```
    android:textAllCaps="true"
    android:textColor="#0E49E3"
    android:textSize="24sp"
    android:textStyle="bold"
    app:layout_constraintEnd_toStartOf="@+id/imageView"
    app:layout_constraintHorizontal_bias="0.0"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent" />

<ImageView
    android:id="@+id/imageView"
    android:layout_width="77dp"
    android:layout_height="88dp"
    android:layout_marginTop="84dp"
    android:layout_marginEnd="28dp"
    android:layout_marginRight="28dp"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:srcCompat="@android:drawable/btn_star_big_on" />

<View
    android:id="@+id/divider"
    android:layout_width="match_parent"
    android:layout_height="1dp"
    android:layout_marginTop="48dp"
    android:background="?android:attr/listDivider"
    app:layout_constraintTop_toBottomOf="@+id/textView"
    tools:layout_editor_absoluteX="16dp" />

<TextView
    android:id="@+id/textView2"
    android:layout_width="280dp"
    android:layout_height="50dp"
    android:layout_marginTop="20dp"
    android:fontFamily="serif"
    android:gravity="center"
    android:text="john smith"
    android:textAllCaps="true"
    android:textColor="#911111"
    android:textSize="24sp"
```

```
    android:textStyle="bold"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.496"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="@+id/divider" />

<EditText
    android:id="@+id/editTextTextMultiLine"
    android:layout_width="280dp"
    android:layout_height="150dp"
    android:layout_marginTop="8dp"
    android:ems="10"
    android:gravity="center"
    android:inputType="textMultiLine"
    android:text="#1111,
    HAMPANKATTA,
    Mangalore, Karnataka"
    android:textAllCaps="true"
    android:textColor="#450D0D"
    android:textSize="24sp"
    android:textStyle="bold"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.496"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView4" />

<TextView
    android:id="@+id/textView3"
    android:layout_width="280dp"
    android:layout_height="50dp"
    android:layout_marginTop="8dp"
    android:gravity="center"
    android:text="Design Engineer"
    android:textColor="#881A1A"
    android:textSize="24sp"
    android:textStyle="bold"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.496"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView2" />
```

```
    <TextView
        android:id="@+id/textView4"
        android:layout_width="280dp"
        android:layout_height="50dp"
        android:layout_marginTop="8dp"
        android:gravity="center"
        android:text="9999999999"
        android:textColor="#B81919"
        android:textSize="24sp"
        android:textStyle="bold"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.496"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView3" />

    <TextView
        android:id="@+id/textView5"
        android:layout_width="280dp"
        android:layout_height="50dp"
        android:layout_marginTop="8dp"
        android:gravity="center"
        android:text="johnsmith@gmail.com"
        android:textColor="#610909"
        android:textSize="24sp"
        android:textStyle="bold"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.496"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/editTextTextMultiLine" />

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

MainAcitivity.java

```
package com.example.visitingcard;
import androidx.appcompat.app.AppCompatActivity;
import android.os.Bundle;
public class MainActivity extends AppCompatActivity {
    @Override
```

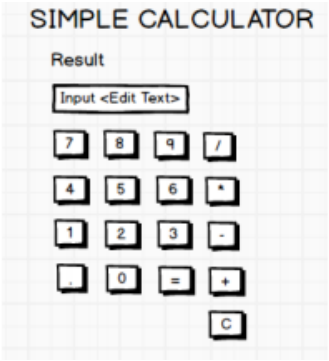
```
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }
}
```

Output

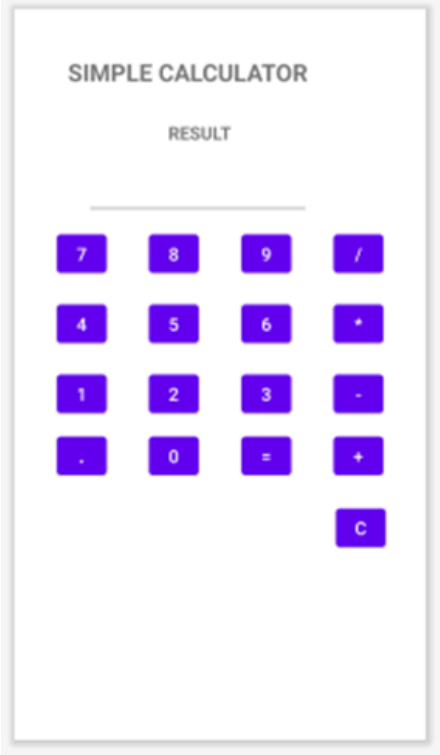
Viva Questions

1. **What is Android?**
2. **What Is the Google Android SDK?**
3. **What is the Android Architecture?**
4. **What is the importance of having an emulator within the Android environment?**
5. **What items are important in every Android project?**

2. Develop an Android application using controls like Button, TextView, EditText for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division.



Design



Procedure

1. Create a New Android Project with Empty Activity.
2. Design the UI by using the following widgets:

RelativeLayout – this item governs how the other items are laid out, or displayed on the screen. The RelativeLayout is used to position child elements in relation to each other, or to itself.

TextView – this item is used to display text. Users are not expected to interact with this item. The result of computations are displayed using a TextView.

EditText – this is a kind of TextView that users can edit, and change the text. However, since the calculator allows only a fixed set of inputs, we set the edit text to be non-editable. When the user clicks on numbers, we display the numbers in the EditText.

Button – this item allows interaction by the user, and ideally, should respond to clicks by the user. We use buttons for the numbers, and operators in the calculator

3. Navigate to the app > res > layout > activity_main.xml.
4. In the activity_main.xml, create the reference of Buttons and EditText override the method onCreate() which is the method of Activity class
5. Add Listeners to Button Click Event
6. Create a class which implements OnClickListener interface.
7. Override onClick() method of OnClickListener Interface.
8. Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.
9. Create a logic to Add/Subtract/Multiply/Divide to perform arithmetic operation on 2 operands.

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="327dp"
        android:layout_height="47dp"
        android:gravity="center"
        android:text="SIMPLE CALCULATOR"
        android:textSize="24sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
```

```
    app:layout_constraintHorizontal_bias="0.119"
    app:layout_constraintLeft_toLeftOf="parent"
    app:layout_constraintRight_toRightOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.058" />

<TextView
    android:id="@+id/textView"
    android:layout_width="202dp"
    android:layout_height="34dp"
    android:layout_marginStart="84dp"
    android:layout_marginLeft="84dp"
    android:layout_marginTop="20dp"
    android:gravity="center"
    android:text="RESULT"
    android:textSize="18sp"
    android:textStyle="bold"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView2" />

<EditText
    android:id="@+id/txtres"
    android:layout_width="223dp"
    android:layout_height="59dp"
    android:layout_marginStart="72dp"
    android:layout_marginLeft="72dp"
    android:layout_marginTop="8dp"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView" />

<Button
    android:id="@+id/b1"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:layout_marginTop="20dp"
    android:text="1"
    android:textSize="18sp"
    app:layout_constraintEnd_toStartOf="@+id/b2"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toStartOf="parent"
```

```
    app:layout_constraintTop_toBottomOf="@+id/b4" />

<Button
    android:id="@+id/b8"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:text="8"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="@+id/b7"
    app:layout_constraintEnd_toStartOf="@+id/b9"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/b7"
    app:layout_constraintTop_toTopOf="@+id/b7" />

<Button
    android:id="@+id/b6"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:text="6"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="@+id/b5"
    app:layout_constraintEnd_toStartOf="@+id/bmul"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/b5"
    app:layout_constraintTop_toTopOf="@+id/b5" />

<Button
    android:id="@+id/bmin"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:text="-"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="@+id/b3"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/b3"
    app:layout_constraintTop_toTopOf="@+id/b3" />

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

```
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:text="+"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="@+id/beq"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/beq"
    app:layout_constraintTop_toTopOf="@+id/beq" />

<Button
    android:id="@+id/b7"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:layout_marginTop="12dp"
    android:text="7"
    android:textSize="18sp"
    app:layout_constraintEnd_toStartOf="@+id/b8"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/txtres" />

<Button
    android:id="@+id/b9"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:text="9"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="@+id/b8"
    app:layout_constraintEnd_toStartOf="@+id/bdiv"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/b8"
    app:layout_constraintTop_toTopOf="@+id/b8" />

<Button
    android:id="@+id/b4"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:layout_marginTop="20dp"
    android:text="4"
```

```
    android:textSize="18sp"
    app:layout_constraintEnd_toStartOf="@+id/b5"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/b7" />

<Button
    android:id="@+id/b3"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:text="3"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="@+id/b2"
    app:layout_constraintEnd_toStartOf="@+id/bmin"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/b2"
    app:layout_constraintTop_toTopOf="@+id/b2" />

<Button
    android:id="@+id/bclear"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:layout_marginTop="20dp"
    android:layout_marginEnd="40dp"
    android:layout_marginRight="40dp"
    android:text="C"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/bplus"
    app:layout_constraintVertical_bias="0.01" />

<Button
    android:id="@+id/bdot"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:layout_marginTop="12dp"
    android:text="."
    android:textSize="18sp"
    android:textStyle="bold"
```

```
    app:layout_constraintEnd_toStartOf="@+id/b0"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/b1" />

<Button
    android:id="@+id/bdiv"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:text="/"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="@+id/b9"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/b9"
    app:layout_constraintTop_toTopOf="@+id/b9" />

<Button
    android:id="@+id/b5"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:text="5"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="@+id/b4"
    app:layout_constraintEnd_toStartOf="@+id/b6"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/b4"
    app:layout_constraintTop_toTopOf="@+id/b4" />

<Button
    android:id="@+id/b2"
    android:layout_width="50dp"
    android:layout_height="50dp"
    android:text="2"
    android:textSize="18sp"
    app:layout_constraintBottom_toBottomOf="@+id/b1"
    app:layout_constraintEnd_toStartOf="@+id/b3"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/b1"
    app:layout_constraintTop_toTopOf="@+id/b1" />
```

```
    <Button
        android:id="@+id/b0"
        android:layout_width="50dp"
        android:layout_height="50dp"
        android:text="0"
        android:textSize="18sp"
        app:layout_constraintBottom_toBottomOf="@+id/bdot"
        app:layout_constraintEnd_toStartOf="@+id/beq"
        app:layout_constraintHorizontal_bias="0.5"
        app:layout_constraintStart_toEndOf="@+id/bdot"
        app:layout_constraintTop_toTopOf="@+id/bdot" />

    <Button
        android:id="@+id/bmul"
        android:layout_width="50dp"
        android:layout_height="50dp"
        android:text="*"
        android:textSize="18sp"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.5"
        app:layout_constraintStart_toEndOf="@+id/b6"
        app:layout_constraintTop_toTopOf="@+id/b6" />

    <Button
        android:id="@+id/beq"
        android:layout_width="50dp"
        android:layout_height="50dp"
        android:text="="
        android:textSize="18sp"
        app:layout_constraintBottom_toBottomOf="@+id/b0"
        app:layout_constraintEnd_toStartOf="@+id/bplus"
        app:layout_constraintHorizontal_bias="0.5"
        app:layout_constraintStart_toEndOf="@+id/b0"
        app:layout_constraintTop_toTopOf="@+id/b0" />

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

MainAcitivity.java

```
package com.example.calculator;

import androidx.appcompat.app.AppCompatActivity;
import android.annotation.SuppressLint;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;

public class MainActivity extends AppCompatActivity {
    Button b0, b1, b2, b3, b4, b5, b6, b7, b8, b9, bmin, bplus, bdiv, bmul, bdot, bclear, beq;
    EditText t1;
    float val1, val2;
    boolean addition, subtraction, multiplication, division;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        b0 = (Button) findViewById(R.id.b0);
        b1 = (Button) findViewById(R.id.b1);
        b2 = (Button) findViewById(R.id.b2);
        b3 = (Button) findViewById(R.id.b3);
        b4 = (Button) findViewById(R.id.b4);
        b5 = (Button) findViewById(R.id.b5);
        b6 = (Button) findViewById(R.id.b6);
        b7 = (Button) findViewById(R.id.b7);
        b8 = (Button) findViewById(R.id.b8);
        b9 = (Button) findViewById(R.id.b9);
        bplus = (Button) findViewById(R.id.bplus);
        bmin = (Button) findViewById(R.id.bmin);
        bmul = (Button) findViewById(R.id.bmul);
        bdiv = (Button) findViewById(R.id.bdiv);
        bdot = (Button) findViewById(R.id.bdot);
        beq = (Button) findViewById(R.id.beq);
        bclear = (Button) findViewById(R.id.bclear);
        t1 = (EditText) findViewById(R.id.txtres);
```

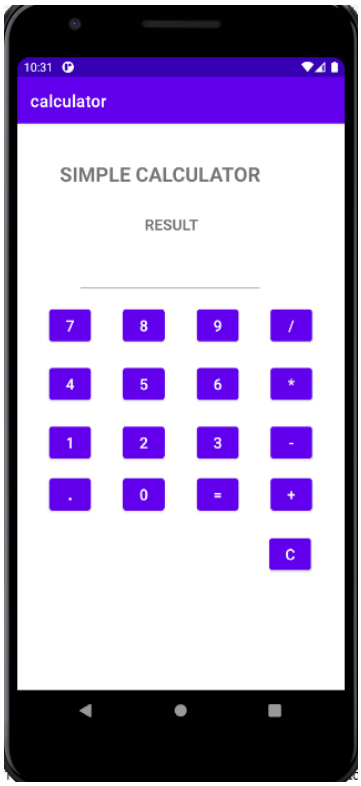
```
b1.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "1");
    }
});

b2.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "2");
    }
});

b3.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "3");
    }
});

b4.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "4");
    }
});

b5.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "5");
    }
});

b6.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "6");
```

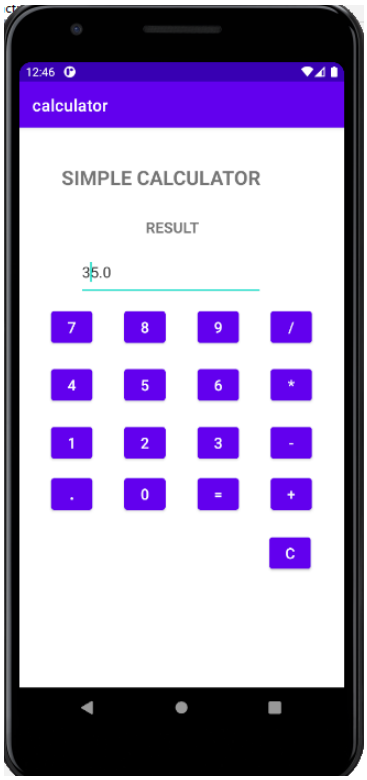
```
    }
});

b7.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "7");
    }
});

b8.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "8");
    }
});

b9.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "9");
    }
});

b0.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText() + "0");
    }
});
bdot.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText(t1.getText()+".");
    }
});

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

```
            val1 = Float.parseFloat(t1.getText() + "");
            addition = true;
            t1.setText(null);
        }

});

bmin.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        val1 = Float.parseFloat(t1.getText() + "");
        subtraction = true;
        t1.setText(null);
    }
});

bmul.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        val1 = Float.parseFloat(t1.getText() + "");
        multiplication = true;
        t1.setText(null);
    }
});

bdiv.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        val1 = Float.parseFloat(t1.getText() + "");
        division = true;
        t1.setText(null);
    }
});

beq.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        val2 = Float.parseFloat(t1.getText() + "");

        if (addition == true) {
```

```
            t1.setText(val1 + val2 + "");
            addition = false;
        }

        if (subtraction == true) {
            t1.setText(val1 - val2 + "");
            subtraction = false;
        }

        if (multiplication == true) {
            t1.setText(val1 * val2 + "");
            multiplication = false;
        }

        if (division == true) {
            t1.setText(val1 / val2 + "");
            division = false;
        }
    }
});
bclear.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        t1.setText("");
    }
});
}
}
```

Sample Output





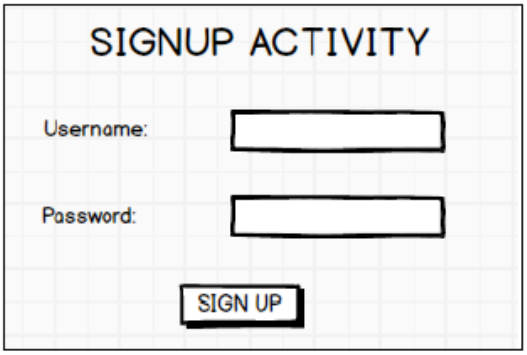
Viva Questions

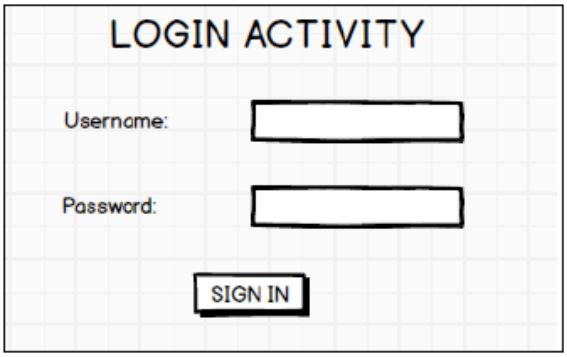
1. **Describe Activities.**
2. **What are the four essential states of an activity?**
3. **What role does Dalvik play in Android development?**
4. **What is the AndroidManifest.xml?**
5. **What is the proper way of setting up an Android-powered device for app development?**

3. Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules:

- **Password should contain uppercase and lowercase letters.**
- **Password should contain letters and numbers.**
- **Password should contain special characters.**
- **Minimum length of the password (the default value is 8).**

On successful SIGN UP proceed to the next Login activity. Here the user should SIGN IN using the Username and Password created during signup activity. If the Username and Password are matched, then navigate to the next activity which displays a message saying "Successful Login" or else display a toast message saying "Login Failed". The user is given only two attempts and after that display a toast message saying "Failed Login Attempts" and disable the SIGN IN button. Use Bundle to transfer information from one activity to another.





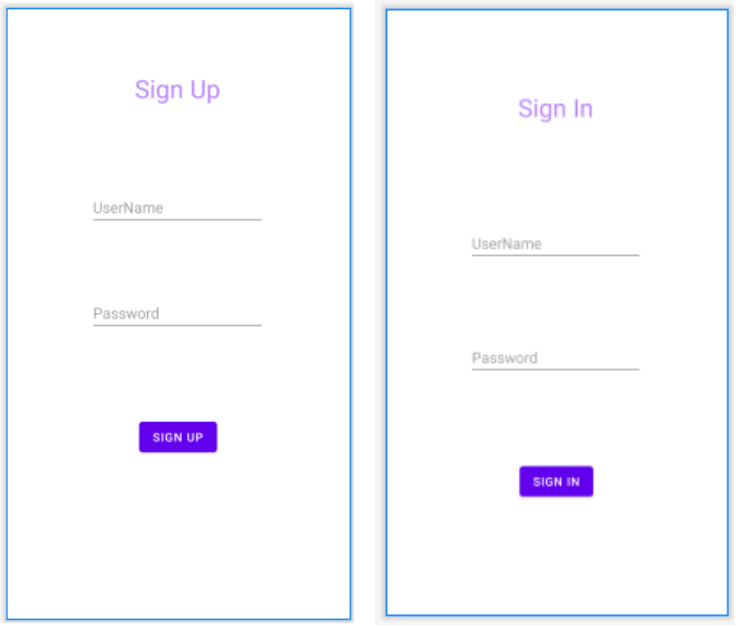
Procedure

1. Create a New Android Project with Empty Activity.
2. Open activity_main.xml file from res -> layout folder, check/add Constraint Layout as the root view.
3. Create Signup Layout using Drag and Drop framework design the layout.
4. Create One more Empty Activity LoginActivity.
5. Open activity_login.xml file from rel -> layout folder, check/add Constraint Layout as the root view.
6. Create Login Layout using Drag and Drop framework.
7. Add Listeners to Button Click Event:
    - Create a class which implements OnClickListener interface.

- Override onClick() method of OnClickListener Interface.
- Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.

8. Use Regular Expression**"^(?=.*[A-Z])(?=.*[a-z])(?=.*\\d)(?=.*[@$!])[A-Za-z\\d@$!]{8,}$"** to validate the password.

Design



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">

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

```
    android:inputType="textPersonName"
    android:hint="UserName"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.497"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.316" />

<EditText
    android:id="@+id/password"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:ems="10"
    android:inputType="textPassword"
    android:hint="Password"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.497"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent" />

<Button
    android:id="@+id/signup"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Sign Up"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:layout_constraintVertical_bias="0.717" />

<TextView
    android:id="@+id/textView"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Sign Up Page"
    android:textSize="30dp"
    android:textColor="@color/white"
```

```
        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="0.11" />


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

activity_signin.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=".signin">
    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Sign In Page"
        android:textSize="30dp"
        android:textColor="@color/white"
        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="0.143" />

    <EditText
        android:id="@+id/username"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:ems="10"
        android:inputType="textPersonName"
```

```
        android:hint="UserName"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.497"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.38" />

    <EditText
        android:id="@+id/password"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:ems="10"
        android:inputType="textPassword"
        android:hint="Password"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.497"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.581" />

    <Button
        android:id="@+id/signin"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Sign In"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.8" />

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

MainActivity.java

```
package com.example.signup;

import androidx.appcompat.app.AppCompatActivity;
import android.content.Intent;
```

```
import android.os.Bundle;
import android.service.autofill.FieldClassification;
import android.view.View;
import android.widget.Button;
import android.widget.EditText; import android.widget.Toast;
import java.util.regex.Matcher; import java.util.regex.Pattern;

public class MainActivity extends AppCompatActivity {
   EditText username,password;
   Button signUpBtn;
   String regularExpr="^(?=.*[A-Z])(?=.*[a-z])(?=.*\\d)(?=.*[@$!])[A-Za-z\\d @$!]{8,}$";
   @Override
   protected void onCreate(Bundle savedInstanceState) {
      super.onCreate(savedInstanceState);
      setContentView(R.layout.activity_main);
      username = findViewById(R.id.username);
      password = findViewById(R.id.password);
      signUpBtn = findViewById(R.id.signup);

      signUpBtn.setOnClickListener(new View.OnClickListener() { @Override
      public void onClick(View v) {
         String uname = username.getText().toString();
         String pwd = password.getText().toString();
         if(validatePassword(pwd)){
            Bundle bundle = new Bundle();
            bundle.putString("username",uname);
               bundle.putString("password",pwd);
            Intent intent = new Intent(MainActivity.this,signin.class);
            intent.putExtras(bundle); startActivity(intent);

         }
         else{
            Toast.makeText(MainActivity.this, "Invlalid Password",
Toast.LENGTH_SHORT).show();
         }
      }
      });
   }

   public boolean validatePassword(String pwd){
```

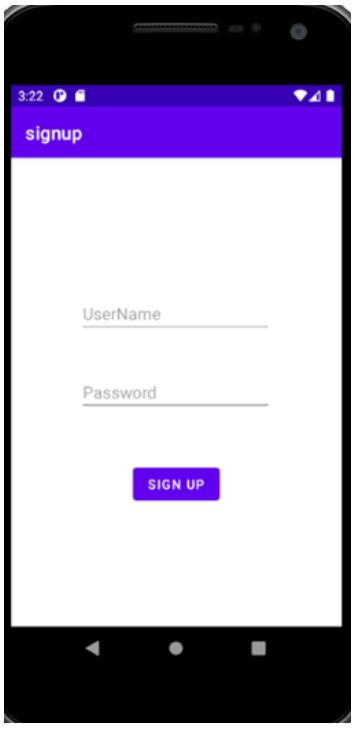
```
        Pattern pattern = Pattern.compile(regularExpr);
        Matcher matcher = pattern.matcher(pwd);

        return matcher.matches();
    }
}
```

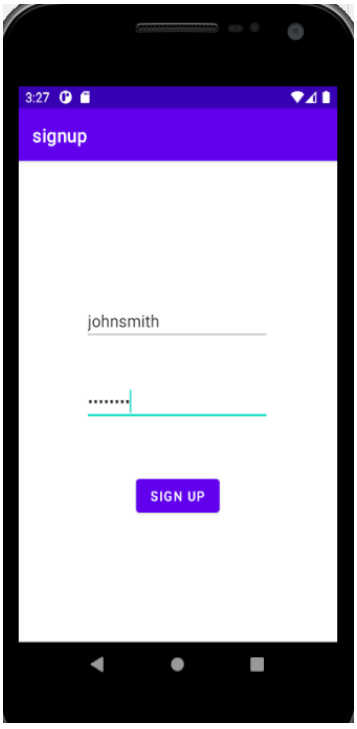
signin.java

```
package com.example.signup;

import androidx.appcompat.app.AppCompatActivity;

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

public class signin extends AppCompatActivity {
    EditText username,password;
    Button signInBtn;
    int count=0;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_signin);
        username = findViewById(R.id.username);
        password = findViewById(R.id.password);
        signInBtn = findViewById(R.id.signin);

        Bundle bundle = getIntent().getExtras();

        String uname = bundle.getString("username");
        String pwd = bundle.getString("password");

        signInBtn.setOnClickListener(new View.OnClickListener() {
            @Override
        public void onClick(View v) {
            String user = username.getText().toString();
```

```
        String pass = password.getText().toString();

        if(user.equals(uname) && pass.equals(pwd)){ Toast.makeText(signin.this, "Success",
              Toast.LENGTH_SHORT).show();
        }
        else {
           count++;
           if (count >= 3) {
              signInBtn.setEnabled(false);
           } else {
              Toast.makeText(signin.this, "Failed", Toast.LENGTH_SHORT).show();
           }
        }
     }
     });

   }
}
```

Sample Output:

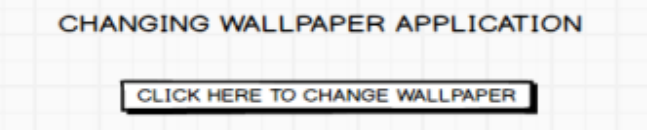




Viva Questions

1. **What is an intent?**
2. **What is a Toast? Write its syntax.**
3. **What is the use of `setOnClickListener()` method?**

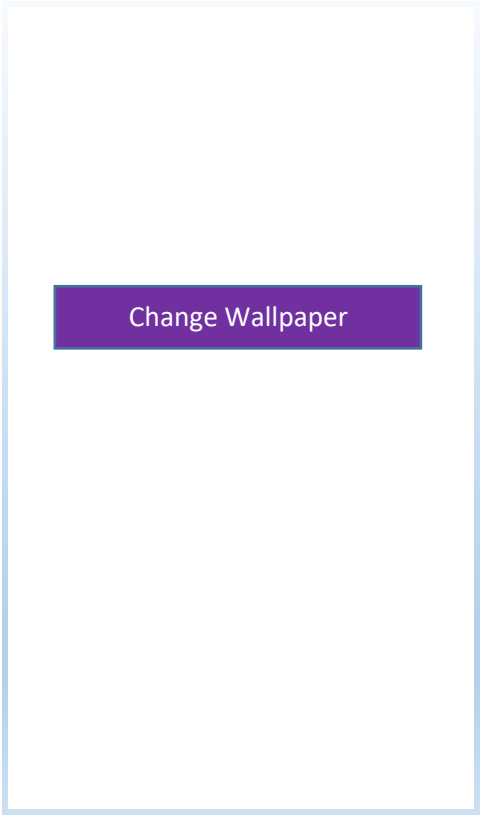
4. Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.



Procedure

1. Create a New Android Project with Empty Activity.
2. Open activity_main.xml file from res→ layout folder, check/add LinearLayout as the root view.
3. Create the layout
4. Add 3 or More images to drawable folder (res→drawable)
5. Declare uses permission android.permission.SET_WALLPAPPER in the AndroidManifest.xml file
6. Schedule Timer task to change the wallpaper on every 30 seconds interval.
7. Initialize and use WallpaperManager.setBitmap() method to change the wallpaper.

Design



AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.wallpaper">
    <uses-permission android:name="android.permission.SET_WALLPAPER"></uses-
permission>
    <application
        android:allowBackup="true"
        android:icon="@mipmap/ic_launcher"
        android:label="@string/app_name"
        android:roundIcon="@mipmap/ic_launcher_round"
        android:supportsRtl="true"
        android:theme="@style/Theme.Wallpaper">
        <activity android:name=".MainActivity">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>
</manifest>
```

activity_main.xml

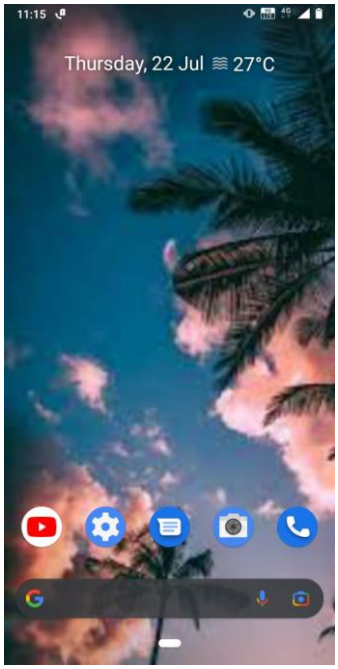
```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:gravity="center"
    tools:context=".MainActivity">

    <Button
        android:id="@+id/btn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_weight="1"
        android:text="Change Wallpaper" />
</LinearLayout>
```

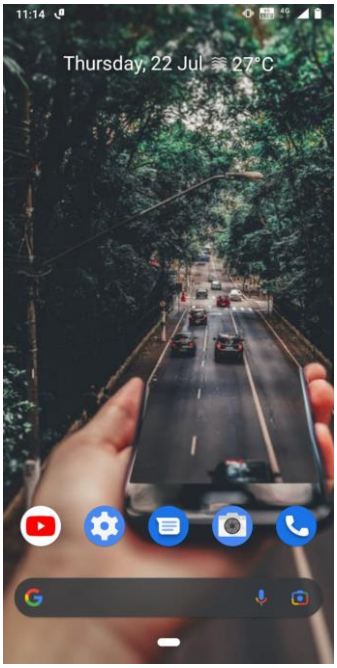
MainActivity.java

```
package com.example.wallpaper;

import androidx.appcompat.app.AppCompatActivity;
import android.app.WallpaperManager;
import android.graphics.BitmapFactory;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import java.io.IOException;
import java.util.Timer;
import java.util.TimerTask;

public class MainActivity extends AppCompatActivity {
    int images[] = new int[]{R.drawable.a1, R.drawable.a2,R.drawable.a3};
    Button btn;
    int i=0;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        btn = findViewById(R.id.btn);
        btn.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                new Timer().schedule(new ChangeWallpaper(),0, 30000);
            }
        });
    }
    class ChangeWallpaper extends TimerTask {
        @Override
        public void run() {
            WallpaperManager w =
                    WallpaperManager.getInstance(getBaseContext());
            try {
                w.setBitmap(BitmapFactory.decodeResource(getResources(),images[i]));
                i++;
                if(i==4    ){
                    i=0;
                }
```

```
            } catch (IOException e) {
                e.printStackTrace();
            }
        }
    }
}
```

Output





Viva Questions

1. **How to set permission for changing wallpaper?**
2. **What is a content provider in android?**
3. **What does the intent filter do in android?**

5. Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a TextView control.

Procedure

1. Create a New Android Project with Empty Activity.
2. Open activity_main.xml file from res→ layout folder, check/add ConstraintLayout as the root view.
3. Create the layout design using Drag and Drop framework.
4. Add Listeners to Button Click Event:
    - Create a class which implements OnClickListener interface.
    - Override onClick() method of OnClickListener Interface.
    - Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.
5. Create a Thread to start the counter logic.
6. Steps to Create a Thread
    - Create a class that extends Thread Class.
    - Override run method of Thread Class.
    - Use start() method of thread class to start the thread.
7. Create Handler class to receive message from child thread, Handler executes in Main Thread.
8. Pass the counter value to be displayed to the handler.
9. Update the UI to display the counter value received from thread.

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:layout_marginStart="85dp"
        android:layout_marginLeft="85dp"
        android:layout_marginEnd="61dp"
        android:layout_marginRight="61dp"
        android:layout_marginBottom="96dp"
        android:gravity="center"
        android:text="Counter Application"
        android:textSize="30dp"
        android:textStyle="bold"
        app:layout_constraintBottom_toTopOf="@+id/counterValue"

        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="1.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.934" />

    <TextView
        android:id="@+id/counterValue"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:hint="Counter Value"
        android:textSize="40dp"
        android:gravity="center"
        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="0.334" />

    <Button
        android:id="@+id/startBtn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="START"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.645" />

    <Button
        android:id="@+id/stopBtn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="STOP"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.781" />

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

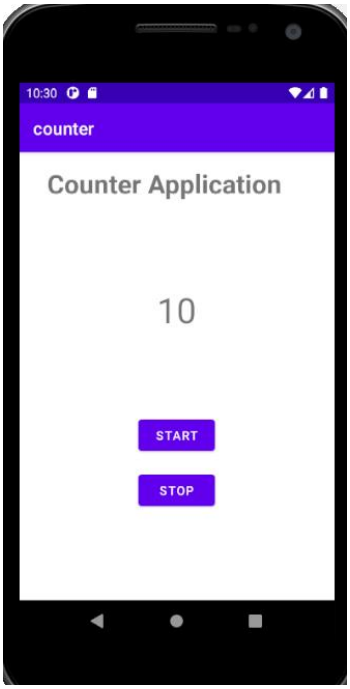
MainActivity.java

```
package com.example.counter;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.os.Handler;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;

public class MainActivity extends AppCompatActivity {
```

```
private static final String TAG = "thread";
Handler mainHandler = new Handler();
int count=0;
boolean running = false;
Button startBtn,stopBtn;
TextView counterVal;
void startThread(){
   NewThread nObj = new NewThread();
   nObj.start();
}

@Override
protected void onCreate(Bundle savedInstanceState) {
   super.onCreate(savedInstanceState);
   setContentView(R.layout.activity_main);
   counterVal = findViewById(R.id.counterValue);
   startBtn = findViewById(R.id.startBtn);
   stopBtn = findViewById(R.id.stopBtn);

   startBtn.setOnClickListener(new View.OnClickListener() {
      @Override
      public void onClick(View v) {
         count=0;
         running=true;
         startThread();
      }
   });
   stopBtn.setOnClickListener(new View.OnClickListener() { @Override
   public void onClick(View v) {
      running=false;
   }
   });
}
class NewThread extends Thread{ @Override
public void run() {
   while(running){
      count++;
      mainHandler.post(new Runnable() { @Override
         public void run() {
            counterVal.setText(String.valueOf(count));
```

```
        }
        });
        try {
            Thread.sleep(1000);
        }
        catch (InterruptedException e) {
            e.printStackTrace();
        }
    }
    }
    }
}
```

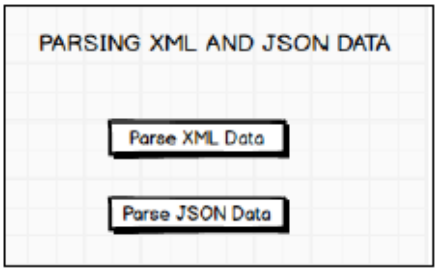
Output

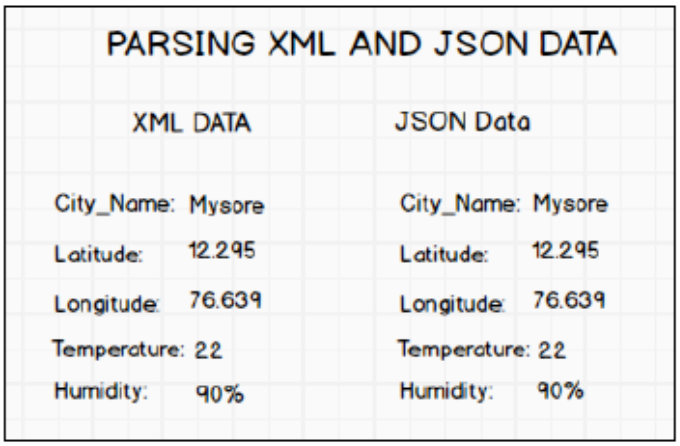


Viva Questions:

1. **Explain the use of 'bundle' in android?**
2. **List the various storages that are provided by Android.**
3. **Where are layouts placed in Android?**
4. **What is a content provider?**

6. Create two files of XML and JSON type with values for City_Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.





Procedure

1. Create a New Android Project with Empty Activity.
2. Open activity_main.xml file from res->layout folder, check/add ConstraintLayout as the root view.
3. Create the layout design using Drag and Drop framework.
4. Add Listeners to Button Click Event:
    - Create a class which implements OnClickListener interface.
    - Override onClick() method of OnClickListener Interface.
    - Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.
5. Create assets folder
6. Create **a.xml** file inside assets folder and paste the below Xml Data
7. Create **a.json** file inside assets folder and paste the below Json Data

8. Read the XML and Json Data in the files and display on screen

a.xml

```
<location>
        <place>Mangalore</place>
        <longitude>30</longitude>
        <latitude>25</latitude>
        <temperature>26</temperature>
        <humidity>15</humidity>
</location>
```

a.json

```
{
“location”:
        {
        “place” : ”Mangalore”,
        “latitude”:25,
        “temperature”:26,
        “humidity”:15
        }
}
```

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/textView3"
        android:layout_width="317dp"
        android:layout_height="64dp"
        android:gravity="center"
        android:text="PARSING XML AND JSON"
        android:textSize="24sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.056" />

    <Button
        android:id="@+id/btn_xml"
        android:layout_width="179dp"
```

```
        android:layout_height="49dp"
        android:layout_marginTop="36dp"
        android:text="Parse XML Data"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView3" />

    <Button
        android:id="@+id/btn_json"
        android:layout_width="179dp"
        android:layout_height="49dp"
        android:layout_marginTop="20dp"
        android:text="Parse JSON Data"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/btn_xml" />

    <TextView
        android:id="@+id/txt_xml"
        android:layout_width="167dp"
        android:layout_height="300dp"
        android:layout_marginStart="16dp"
        android:layout_marginLeft="16dp"
        android:layout_marginTop="60dp"
        android:text=""
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/btn_json" />

    <TextView
        android:id="@+id/txt_json"
        android:layout_width="186dp"
        android:layout_height="301dp"
        android:layout_marginStart="24dp"
        android:layout_marginLeft="24dp"
        android:text="hh"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toEndOf="@+id/txt_xml"
        ap:layout_constraintTop_toTopOf="@+id/txt_xml" />
</androidx.constraintlayout.widget.ConstraintLayout>
```

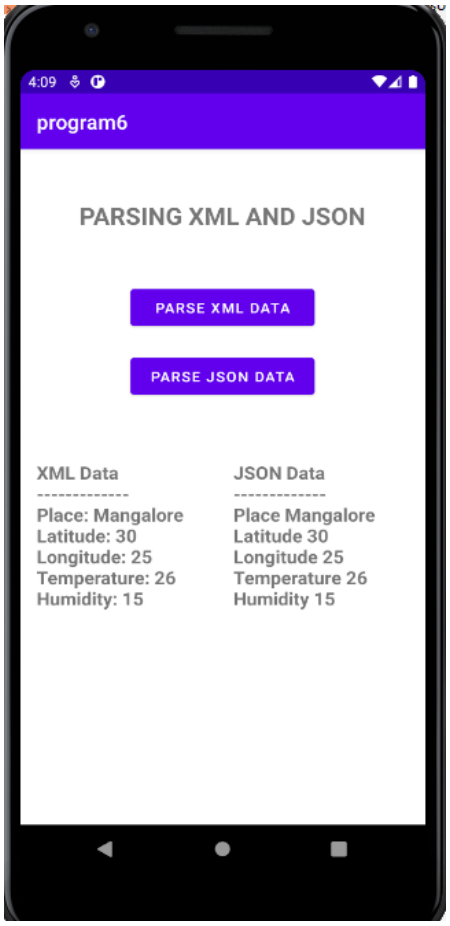
MainAcitivity.java

```
package com.example.program6;

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

import android.os.Build;
import android.os.Bundle;
import android.util.Log;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;
import android.widget.Toast;

import org.json.JSONArray;
import org.json.JSONException;
import org.json.JSONObject;
import org.w3c.dom.Document;
import org.w3c.dom.Element;
import org.w3c.dom.Node;
import org.w3c.dom.NodeList;

import java.io.IOException;
import java.io.InputStream;
import java.nio.charset.StandardCharsets;

import javax.xml.parsers.DocumentBuilder;
import javax.xml.parsers.DocumentBuilderFactory;

public class MainActivity extends AppCompatActivity {

    Button btn_xml, btn_json;
    TextView xmltxt, jsontxt;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
```

```
        setContentView(R.layout.activity_main);

        btn_xml = findViewById(R.id.btn_xml);
        btn_json = findViewById(R.id.btn_json);

        xmltxt = findViewById(R.id.txt_xml);
        jsontxt = findViewById(R.id.txt_json);

        btn_xml.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                try {
                    InputStream is = getAssets().open("a.xml");
                    DocumentBuilderFactory dbf = DocumentBuilderFactory.newInstance();
                    DocumentBuilder db = dbf.newDocumentBuilder();
                    Document d = db.parse(is);
                    StringBuilder s = new StringBuilder();
                    s.append("XML Data");
                    s.append("\n----------");
                    NodeList nodeList = d.getElementsByTagName("location");
                    for (int i = 0; i < nodeList.getLength(); i++) {
                        Node node = nodeList.item(i);
                        if (node.getNodeType() == Node.ELEMENT_NODE) {
                            Element element = (Element) node;
                            s.append("\nPlace: ").append(getValue("place", element));
                            s.append("\nLatitude: ").append(getValue("latitude", element));
                            s.append("\nLongitude: ").append(getValue("longitude", element));
                            s.append("\nTemperature: ").append(getValue("temperature", element));
                            s.append("\nHumidity: ").append(getValue("humidity", element));
                        }
                    }
                    xmltxt.setText(s.toString());

                } catch (Exception e) {
                    e.printStackTrace();
                    Toast.makeText(MainActivity.this, "Error Parsing XML",
Toast.LENGTH_SHORT).show();
                }
            }
        });
```

```
        btn_json.setOnClickListener(new View.OnClickListener() {
            @RequiresApi(api = Build.VERSION_CODES.KITKAT)
            @Override
            public void onClick(View v) {
                String str=null;
                try {
                    InputStream is = getAssets().open("a.json");
                    int size = is.available();
                    byte buffer[] = new byte[size];
                    is.read(buffer);
                    str = new String(buffer);
                    JSONObject j = new JSONObject(str);
                    JSONObject e=j.getJSONObject("location");
                    jsontxt.setText("JSON Data\n----------");
                    jsontxt.append("\nPlace "+e.getString("place"));
                    jsontxt.append("\nLatitude "+e.getString("latitude"));
                    jsontxt.append("\nLongitude "+e.getString("longitude"));
                    jsontxt.append("\nTemperature "+e.getString("temperature"));
                    jsontxt.append("\nHumidity "+e.getString("humidity"));
                } catch (JSONException e) {
                    e.printStackTrace();
                } catch (IOException e) {
                    e.printStackTrace();
                }
            }
        }
        );
    }
        private String getValue (String tag, Element element){
            return
element.getElementsByTagName(tag).item(0).getChildNodes().item(0).getNodeValue();
        }
    }
```

Output



Viva Questions

1. **What is sleep mode in Android?**
2. **What do you mean by a drawable folder in Android?**
3. **Define Android Architecture?**
4. **What is a singleton class in Android?**

.

7. Develop a simple application with one EditText so that the user can write some text in it. Create a button called "Convert Text to Speech" that converts the user input text into voice.

Procedure

1. Create a New Android Project with Empty Activity.
2. Open activity_main.xml file from res→ layout folder, check/add ConstraintLayout as the root view.
3. Create the layout design using Drag and Drop framework.
4. Add Listeners to Button Click Event:
    - Create a class which implments OnClickListener interface.
    - Override onClick() method of OnClickListener Interface.
    - Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.
5. Initialize TextToSpeech Engine and the Language to Speak using setLanguage() method
6. Use Speak() method to speak the text passed to it.

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">

    <EditText
        android:id="@+id/enteredValue"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:ems="10"
        android:inputType="textPersonName"
        android:hint="Enter your Text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.223" />
    <Button
```

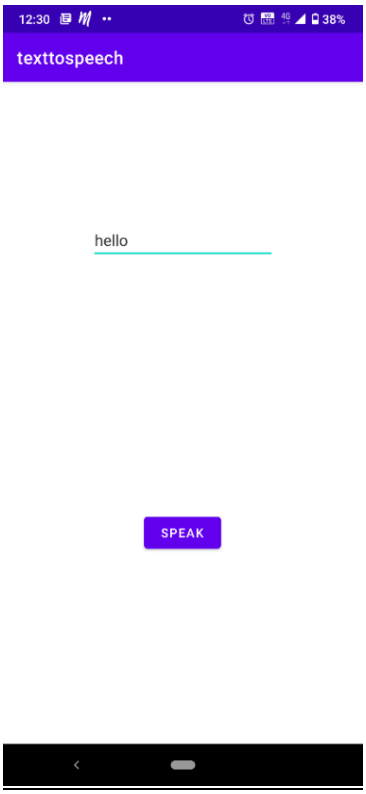
```
        android:id="@+id/speakBtn"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Speak"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.693" />

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

MainActivity.java

```
package com.example.texttospeech;
import androidx.appcompat.app.AppCompatActivity;
import android.os.Bundle;
import android.speech.tts.TextToSpeech;
import android.util.Log;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import java.util.Locale;
public class MainActivity extends AppCompatActivity {
    EditText enteredValue;
    Button speakBtn;
    TextToSpeech textToSpeech;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        speakBtn = findViewById(R.id.speakBtn);
        enteredValue = findViewById(R.id.enteredValue);
        textToSpeech = new TextToSpeech(MainActivity.this, new
                TextToSpeech.OnInitListener() {
            @Override
            public void onInit(int status) {
                if(status == TextToSpeech.SUCCESS){
                    textToSpeech.setLanguage(Locale.ENGLISH);
```

```
                }
                else{
                    Log.e("failed", "onInit: Failed");
                }
            }
        });
    speakBtn.setOnClickListener(new View.OnClickListener() {
        @Override
        public void onClick(View v) {
            String text = enteredValue.getText().toString();
            textToSpeech.speak(text,TextToSpeech.QUEUE_FLUSH,null);
        }
    });
  }
}
```

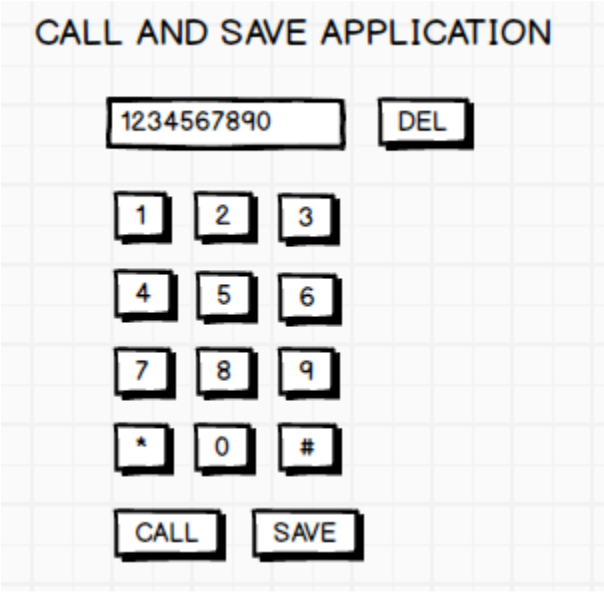
Output



Viva Questions

4. **What is an action?**
5. **What language is supported by Android for application development?**
6. **What composes a typical Android application project?**
7. **Can the bytecode be written in java be run on android?**

8. Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.



Procedure

1. Create a New Android Project with Empty Activity.
2. Open activity_main.xml file from res->layout folder, check/add ConstraintLayout as the root view.
3. Create the layout design using Drag and Drop framework.
4. Add Listeners to Button Click Event:
    - Create a class which implments OnClickListener interface.
    - Override onClick() method of OnClickListener Interface.
    - Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.
5. Declare uses permission android.permission.CALL_PHONE in the manifest file.
6. Use ACTION_CALL intent name and pass the “tel:<phone-number> as URI in intent data and start the call activity.
7. Use intent name and pass the “Telephone Number” and “unknown” as name as intent data call Contacts Save Activity.

activitymain.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/btnSave"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="16dp"
        android:text="Save"
        app:layout_constraintEnd_toStartOf="@+id/btnCall"
        app:layout_constraintHorizontal_bias="0.5"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/btnStar" />
    <Button
        android:id="@+id/btnCall"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="16dp"
        android:text="Call"
        app:layout_constraintEnd_toStartOf="@+id/btnRemove"
        app:layout_constraintHorizontal_bias="0.5"
        app:layout_constraintStart_toEndOf="@+id/btnSave"
        app:layout_constraintTop_toBottomOf="@+id/btn0" />
    <Button
        android:id="@+id/btnRemove"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="16dp"
        android:text="X"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.5"
        app:layout_constraintStart_toEndOf="@+id/btnCall"
        app:layout_constraintTop_toBottomOf="@+id/btnHash" />
```

```
<Button
    android:id="@+id/btnStar"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="20dp"
    android:text="*"
    app:layout_constraintEnd_toStartOf="@+id/btn0"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/btn7" />
<Button
    android:id="@+id/btn0"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="20dp"
    android:text="0"
    app:layout_constraintEnd_toStartOf="@+id/btnHash"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/btnStar"
    app:layout_constraintTop_toBottomOf="@+id/btn8" />
<Button
    android:id="@+id/btnHash"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="20dp"
    android:text="#"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/btn0"
    app:layout_constraintTop_toBottomOf="@+id/btn9" />
<Button
    android:id="@+id/btn7"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="27dp"
    android:text="7"
    app:layout_constraintEnd_toStartOf="@+id/btn8"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/btn4" />
```

```
<Button
    android:id="@+id/btn8"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="27dp"
    android:text="8"
    app:layout_constraintEnd_toStartOf="@+id/btn9"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/btn7"
    app:layout_constraintTop_toBottomOf="@+id/btn5" />
<Button
    android:id="@+id/btn9"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="27dp"
    android:text="9"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/btn8"
    app:layout_constraintTop_toBottomOf="@+id/btn6" />
<Button
    android:id="@+id/btn4"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="28dp"
    android:text="4"
    app:layout_constraintEnd_toStartOf="@+id/btn5"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/btn1" />
<Button
    android:id="@+id/btn5"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="28dp"
    android:text="5"
    app:layout_constraintEnd_toStartOf="@+id/btn6"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/btn4"
    app:layout_constraintTop_toBottomOf="@+id/btn2" />
```

```
<Button
    android:id="@+id/btn6"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="28dp"
    android:text="6"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/btn5"
    app:layout_constraintTop_toBottomOf="@+id/btn3" />
<Button
    android:id="@+id/btn2"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="108dp"
    android:text="2"
    app:layout_constraintEnd_toStartOf="@+id/btn3"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/btn1"
    app:layout_constraintTop_toBottomOf="@+id/display" />
<Button
    android:id="@+id/btn3"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="108dp"
    android:text="3"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toEndOf="@+id/btn2"
    app:layout_constraintTop_toBottomOf="@+id/display" />
<Button
    android:id="@+id/btn1"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="108dp"
    android:text="1"
    app:layout_constraintEnd_toStartOf="@+id/btn2"
    app:layout_constraintHorizontal_bias="0.5"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/display" />
```

```
    <EditText
        android:id="@+id/display"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:ems="10"
        android:inputType="phone"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.195" />

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

MainActivity.java

```
package com.example.callapp;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.net.Uri;
import android.os.Bundle;
import android.provider.ContactsContract;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;

public class MainActivity extends AppCompatActivity {
    EditText display;
    Button btn1,btn2, btn3,btn4, btn5,btn6, btn7,btn8, btn9,btn0;
    Button btnCall,btnSave,btnStar,btnHash,btnRemove;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        btn0 = findViewById(R.id.btn0);
        btn1 = findViewById(R.id.btn1);
        btn2 = findViewById(R.id.btn2);
        btn3 = findViewById(R.id.btn3);
```

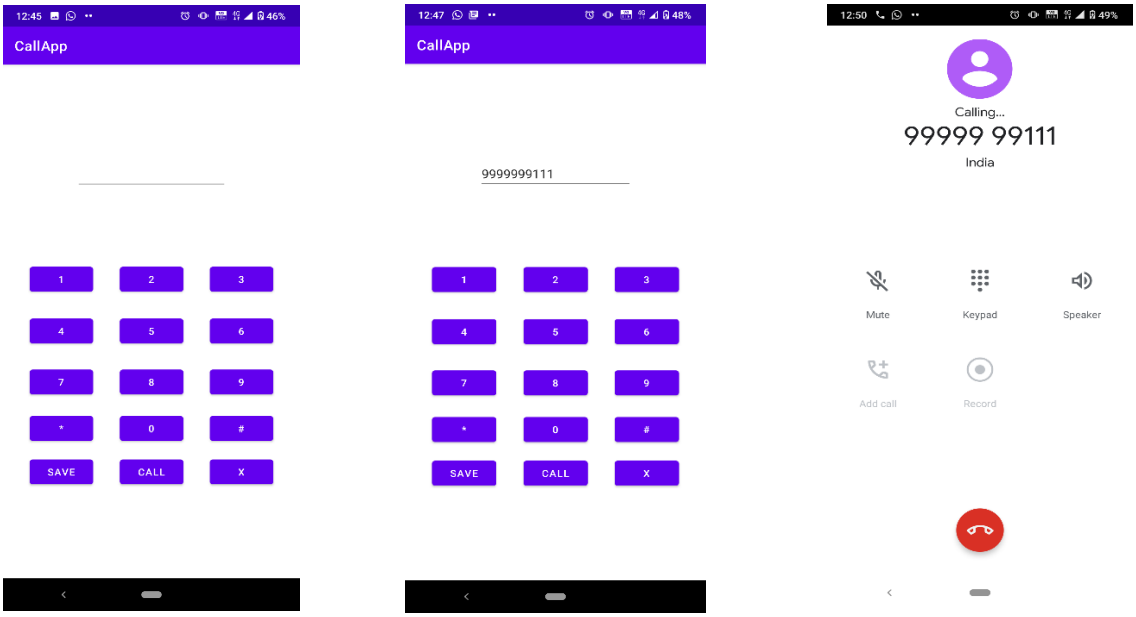
```
btn4 = findViewById(R.id.btn4);
btn5 = findViewById(R.id.btn5);
btn6 = findViewById(R.id.btn6);
btn7 = findViewById(R.id.btn7);
btn8 = findViewById(R.id.btn8);
btn9 = findViewById(R.id.btn9);
btnCall = findViewById(R.id.btnCall);
btnSave = findViewById(R.id.btnSave);
btnRemove = findViewById(R.id.btnRemove);
btnStar = findViewById(R.id.btnStar);
btnHash = findViewById(R.id.btnHash);
display = findViewById(R.id.display);
btn0.setOnClickListener(new View.OnClickListener() {
   @Override
   public void onClick(View v) {
      display.append("0");
   }
});
btn1.setOnClickListener(new View.OnClickListener() {
   @Override
   public void onClick(View v) {
      display.append("1");
   }
});
btn2.setOnClickListener(new View.OnClickListener() {
   @Override
   public void onClick(View v) {
      display.append("2");
   }
});
btn3.setOnClickListener(new View.OnClickListener() {
   @Override
   public void onClick(View v) {
      display.append("3");
   }
});
btn4.setOnClickListener(new View.OnClickListener() {
   @Override
   public void onClick(View v) {
      display.append("4");
```

```
    }
});
btn5.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        display.append("5");
    }
});
btn6.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        display.append("6");
    }
});
btn7.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        display.append("7");
    }
});
btn8.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        display.append("8");
    }
});
btn9.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        display.append("9");
    }
});
btnStar.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        display.append("*");
    }
});
btnHash.setOnClickListener(new View.OnClickListener() {
    @Override
```

```
    public void onClick(View v) {
        display.append("#");
    }
});
btnCall.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        String data = display.getText().toString();
        Intent intent = new Intent(Intent.ACTION_DIAL);
        intent.setData(Uri.parse("tel:"+data));
        startActivity(intent);
    }
});
btnSave.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        String data = display.getText().toString();
        Intent intent = new
                Intent(ContactsContract.Intents.Insert.ACTION);

        intent.setType(ContactsContract.RawContacts.CONTENT_TYPE);

        intent.putExtra(ContactsContract.Intents.Insert.NAME,"Unknown");

        intent.putExtra(ContactsContract.Intents.Insert.PHONE,data);
        startActivity(intent);
    }
});
btnRemove.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        String data = display.getText().toString();
        if (data.length() > 0) {
            String val = data.substring(0, data.length() - 1);
            display.setText(val);
        } else {
            display.setText("");
        }
    }
});
```

```
    }
}
```

Output



Viva Questions

1. **What database is used in Android?**
2. **What are the differences between Service and Thread?**
3. **What is an Adapter in Android?**