# List of Experiments

## B.E. (Comp.) Sem VII

## (July-Oct 2021)

## Subject: CSL702: Mobile Communication & Computing

**Experiment 1**

**Aim:** Implement basic graphical 2D primitives using Android

**Theory:**

-Open eclipse or android studio and create new project
-Select our project in the project explorer
-Go to res folder and select layout Double click the main xml file
-Type the code for main.xml or drag and drop various components used in our program
-Drag and drop relative layout and change its properties
-Drag and drop image view and change its properties according to our programs
-Screen layout can be viewed by clicking graphics layout tab
-Include necessary files
-Override OnCreate() function
-Create Image view and initialize its using id of some components used in the xml program
-Save the program
-Run the program
-Output can be viewed in the android emulator

**Program:**

MainActivity.java

```
package com.example.myapplication;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;

public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
       // setContentView(new Shapes3D.MyView(this));
        setContentView(new Shapes.MyView(this));
    }
}
```

Shapes.java

```
package com.example.myapplication;
import android.content.Context;
import android.graphics.Canvas;
import android.graphics.Color;
import android.graphics.Paint;
import android.graphics.Path;
import android.graphics.Point;
import android.os.Bundle;
import android.view.View;
import androidx.appcompat.app.AppCompatActivity;


public class Shapes extends AppCompatActivity {
```

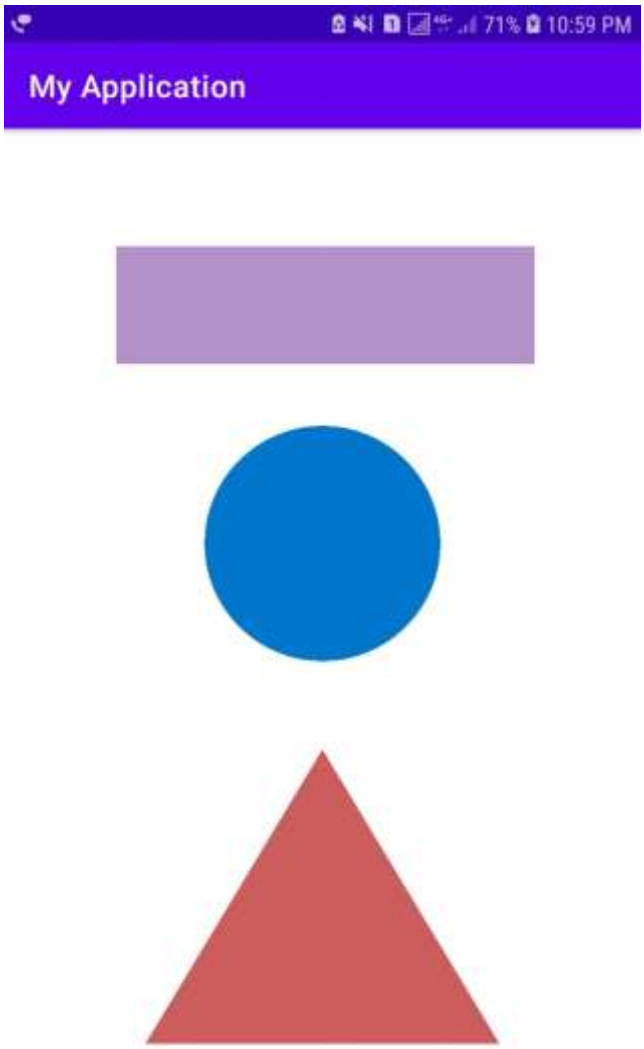
```
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(new MyView(this)); }

    public static class MyView extends View {

        public MyView(Context context){
            super(context);
        }

        @Override
        protected void onDraw(Canvas canvas){
            super.onDraw(canvas);
            int x=getWidth();
            int y=getHeight();
            int radius=200;

            Paint paint=new Paint();
            Path path=new Path();
            paint.setStyle(Paint.Style.FILL);
            paint.setColor(Color.WHITE);

            canvas.drawPaint(paint);

            //Circle
            paint.setColor(Color.parseColor("#0077CC"));
            canvas.drawCircle(x/2,y/2-150,radius,paint);

            //Rectangle
            paint.setColor(Color.parseColor("#b491c8"));
            canvas.drawRect(x/2-350,200,900,400,paint);

            //Triangle
            Point a=new Point(x/2,y/2+200);
            Point b=new Point(x/2-300,y/2+700);
            Point c=new Point(x/2+300,y/2+700);


            paint.setColor(Color.parseColor("#CD5C5C"));
            path.lineTo(a.x,a.y);
            path.lineTo(b.x,b.y);
            path.lineTo(c.x,c.y);
            path.lineTo(a.x,a.y);
            path.close();
            canvas.drawPath(path,paint);

        }
    }
}
```

AndroidManifest.xml

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

    <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.MyApplication">
        <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>
```

**Output:**



**Experiment 2**

**Aim:** Implement basic graphical 3D primitives using Android

**Theory:**

-Open eclipse or android studio and create new project
-Select our project in the project explorer
-Go to res folder and select layout Double click the main xml file
-Type the code for main.xml or drag and drop various components used in our program
-Drag and drop relative layout and change its properties
-Drag and drop image view and change its properties according to our programs
-Screen layout can be viewed by clicking graphics layout tab
-Include necessary files
-Override OnCreate() function
-Create Image view and initialize its using id of some components used in the xml program
-Save the program
-Run the program
-Output can be viewed in the android emulator

**Program:**

MainActivity.java

```
package com.example.myapplication;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;

public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
       // setContentView(new Shapes3D.MyView(this));
        setContentView(new Shapes.MyView(this));
    }
}
```

Shapes3D.java

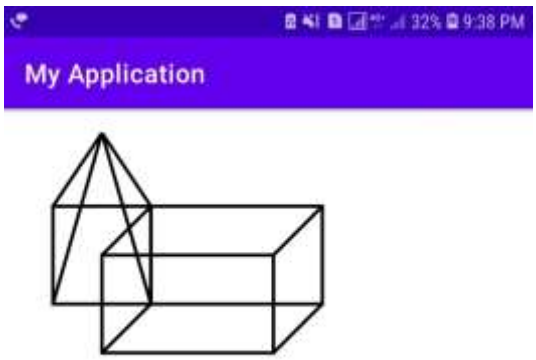
```
package com.example.myapplication;

import android.content.Context;
import android.graphics.Canvas;
import android.graphics.Color;
import android.graphics.Paint;
import android.graphics.Path;
import android.graphics.Point;
import android.os.Bundle;
import android.view.View;
import androidx.appcompat.app.AppCompatActivity;

public class Shapes3D extends AppCompatActivity {
```

```
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(new MyView(this));
    }
    public static class MyView extends View {
        public MyView(Context context){
            super(context);
        }
        @Override
        protected void onDraw(Canvas canvas){
            super.onDraw(canvas);
            Paint paint=new Paint();
            paint.setStyle(Paint.Style.STROKE);
            paint.setStrokeWidth(7);
            paint.setColor(Color.WHITE);
            int x=getWidth();
            int y=getHeight();
            canvas.drawPaint(paint);
            paint.setAntiAlias(true);
            paint.setColor(Color.parseColor("#000000"));


            //cuboid
            canvas.drawRect(200,300,550,500,paint);
            canvas.drawRect(300,200,650,400,paint);
            canvas.drawLine(200,300,300,200,paint);
            canvas.drawLine(200,500,300,400,paint);
            canvas.drawLine(550,500,650,400,paint);
            canvas.drawLine(550,300,650,200,paint);

            //pyramid
            canvas.drawRect(100,200,300,400,paint);
            canvas.drawLine(100,200,200,50,paint);
            canvas.drawLine(200,50,300,200,paint);
            canvas.drawLine(300,400,200,50,paint);
            canvas.drawLine(100,400,200,50,paint);

            //cube
//              canvas.drawRect(300,200,550,400,paint);
//              canvas.drawRect(200,100,450,300,paint);
//              canvas.drawLine(300,200,200,100,paint);
//              canvas.drawLine(300,390,200,290,paint);
//              canvas.drawLine(550,200,450,100,paint);
//              canvas.drawLine(550,390,450,290,paint);


        }
    }

}
```

AndroidManifest.xml

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

    <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.MyApplication">
        <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>
```

**Output:**



**Experiment 3**

**Aim:** Implement form with GUI Components using Android

**Theory:**

-Open eclipse or android studio and create new project
-Select our project in the project explorer
-Go to res folder and select layout Double click the main xml file
-Type the code for main.xml or drag and drop various components used in our program
-Drag and drop relative layout and change its properties
-Drag and drop image view and change its properties according to our programs
-Screen layout can be viewed by clicking graphics layout tab
-Include necessary files
-Override OnCreate() function
-Create Image view and initialize its using id of some components used in the xml program
-Save the program
-Run the program
-Output can be viewed in the android emulator

**Program:**

MainActivity.java

```
package com.example.form1;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Context;
import android.content.Intent;
import android.os.Bundle;
import android.text.TextUtils;
import android.util.Patterns;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity {

    EditText name;
    EditText password;
    EditText phone;
    EditText email;
    Context context;

    String n, p, phno, e;
    Button submit;


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

        name = findViewById(R.id.Dname);
```

```
        password = findViewById(R.id.PASSWORD);
        email = findViewById(R.id.EMAIL);
        phone = findViewById(R.id.PHONE);
        submit = findViewById(R.id.SUBMIT);

        submit.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                checkDataEntered();


                n = name.getText().toString();
                e = email.getText().toString();
                phno = phone.getText().toString();
                p = password.getText().toString();

                Intent intent = new Intent(context, MainActivity2.class);
                intent.putExtra("name", n);
                intent.putExtra("email", e);
                intent.putExtra("phone", phno);

                startActivity(intent);


            }
        });
    }

    boolean isEmail(EditText text) {
        CharSequence email = text.getText().toString();
        return (!TextUtils.isEmpty(email) &&
Patterns.EMAIL_ADDRESS.matcher(email).matches());
    }

    boolean isEmpty(EditText text) {
        CharSequence str = text.getText().toString();
        return TextUtils.isEmpty(str);
    }

    void checkDataEntered() {

        if (isEmpty(name)) {
            Toast t = Toast.makeText(this, "You must enter first name to
register!", Toast.LENGTH_SHORT);
            t.show();
        }


        if (isEmpty(password)) {
            password.setError("password is required!");
        }


        if (isEmail(email) == false) {
            email.setError("Enter valid email!");
        }
    }

}
```

MainActivity2.java

```
package com.example.form1;

import android.content.Context;
import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.TextView;

import androidx.appcompat.app.AppCompatActivity;

import java.util.ArrayList;

public class MainActivity2 extends AppCompatActivity {
    Context context;
    TextView tvName, tvEmail, tvContactNo;
    View dname;
    String demail;
    String dphone;
    String dpassword;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity2_main);
        context = MainActivity2.this;
        Context context;
        TextView tvName, tvEmail, tvContactNo;
        String name, email, phone;

        Intent intent = getIntent();
        name = intent.getStringExtra("name");
        email = intent.getStringExtra("email");
        phone = intent.getStringExtra("phone");


        tvName = findViewById(R.id.dname);
        tvEmail = findViewById(R.id.demail);
        tvContactNo = findViewById(R.id.dphone);

        tvName.setText("Name: "+ name);
        tvEmail.setText("Email: "+ email);
        tvContactNo.setText("Contact No: "+ phone);


    }
}
```

AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.form1">

    <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.Form1">
        <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=".MainActivity2" 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**


**Experiment 4**

**Aim:** Implement form with GUI Components and Database using Android

**Theory:**

-Open eclipse or android studio and create new project
-Select our project in the project explorer
-Go to res folder and select layout Double click the main xml file
-Type the code for main.xml or drag and drop various components used in our program
-Drag and drop relative layout and change its properties
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-Include necessary files
-Override OnCreate() function
-Create Image view and initialize its using id of some components used in the xml program
-Save the program
-Run the program
-Output can be viewed in the android emulator

**Program:**

DatabaseHelper.java

```
package com.example.employeedetails;

import android.content.ContentValues;
import android.content.Context;
import android.database.Cursor;
import android.database.MatrixCursor;
import android.database.SQLException;
import android.database.sqlite.SQLiteDatabase;
import android.database.sqlite.SQLiteOpenHelper;
import android.util.Log;

import androidx.annotation.Nullable;

import java.util.ArrayList;

public class DatabaseHelper extends SQLiteOpenHelper {

    public static final String DATABASE_NAME = "Employee Details";
    public static final String TABLE_NAME = "Users";

// COL_0 will be user Id which is AUTOINCREMENT
    public static final String COL_1 = "Email";
    public static final String COL_2 = "Name";
    public static final String COL_3= "Contact_No";
    public static final String COL_4 = "Gender";

    public DatabaseHelper(@Nullable Context context) {
        super(context, DATABASE_NAME, null, 1);
    }

    @Override
    public void onCreate(SQLiteDatabase db) {
        db.execSQL("create table Users (Id INTEGER PRIMARY KEY
```

```
AUTOINCREMENT,Name TEXT, Email TEXT, Contact_No TEXT, Gender TEXT)");
    }

    @Override
    public void onUpgrade(SQLiteDatabase db, int oldVersion, int
newVersion) { db.execSQL("DROP TABLE IF EXISTS Users");
        onCreate(db);
    }

    // method for inserting data of a single user
    public boolean insertUserDetails(String email, String name, String
contactNo, String gender)
    {
        SQLiteDatabase db = this.getWritableDatabase();
        ContentValues contentValues = new ContentValues();
        contentValues.put(COL_1, email);
        contentValues.put(COL_2, name);
        contentValues.put(COL_3, contactNo);
        contentValues.put(COL_4, gender);

        long insertResult = db.insert(TABLE_NAME, null, contentValues);

        if(insertResult == -1) {
            return false;
        } else {
            return true;
        }
    }

    // method for get data of all users
    public Cursor getAllUserDetails() {
        SQLiteDatabase db = this.getWritableDatabase();
        Cursor cursor = db.rawQuery("SELECT * FROM " + TABLE_NAME, null);
        return cursor;
    }

}
```

FirstActivity.java

```
package com.example.employeedetails;
import androidx.appcompat.app.AppCompatActivity;

import android.content.Context;
import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.RadioGroup;
import android.widget.ScrollView;
import android.widget.Toast;

import com.google.android.material.textfield.TextInputEditText;
import com.google.android.material.textfield.TextInputLayout;
public class FirstActivity extends AppCompatActivity
{
    Context context;
    DatabaseHelper databaseHelper;

    ScrollView svRegistrationForm;
    TextInputLayout tilName, tilEmail, tilContactNo;
    TextInputEditText tietName, tietEmail, tietContactNo;
```

```
    RadioGroup rgGender;
    Button btnSignUp, btnViewUsers;
    String name, email, contactNo, gender;
    @Override
    protected void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_first);

        context = FirstActivity.this;
        databaseHelper = new DatabaseHelper(context);

        svRegistrationForm = findViewById(R.id.sv_registration_form);
        tilName = findViewById(R.id.til_name);
        tilEmail = findViewById(R.id.til_email);
        tilContactNo = findViewById(R.id.til_contact_no);
        tietName = findViewById(R.id.tiet_name);
        tietEmail = findViewById(R.id.tiet_email);
        tietContactNo = findViewById(R.id.tiet_contact_no);
        rgGender = findViewById(R.id.rg_gender);
        btnSignUp = findViewById(R.id.btn_insert_data);
        btnViewUsers = findViewById(R.id.btn_view_users);

        rgGender.setOnCheckedChangeListener(new
RadioGroup.OnCheckedChangeListener()
        { @Override
            public void onCheckedChanged(RadioGroup group, int checkedId) {
                if(checkedId == R.id.rb_male) {
                    gender = "Male";
                } else {
                    gender = "Female";
                }
            }
        });

        btnSignUp.setOnClickListener(new View.OnClickListener()
        {
            @Override
            public void onClick(View v) {
                if(validateForm()) {
                    name = tietName.getText().toString(); email =
tietEmail.getText().toString();
                    contactNo = tietContactNo.getText().toString();

                    boolean insertResult =
databaseHelper.insertUserDetails(email, name, contactNo,

                            gender);


                    if(insertResult) {
                        Toast.makeText(context, "Data inserted
succesfully",

                                Toast.LENGTH_SHORT).show();
                    } else {
                        Toast.makeText(context, "Data not inserted",
Toast.LENGTH_SHORT).show();
                    }

                    Intent intent = new Intent(context,
```

```
FirstActivity.class); startActivity(intent);
                }
            }
            });

            btnViewUsers.setOnClickListener(new View.OnClickListener() {
@Override
            public void onClick(View v) {
                Intent intent = new Intent(context, SecondActivity.class);
startActivity(intent);
            }
            });

    }

    public boolean validateForm() {
        if(tietName.getText().toString().isEmpty()) {
tilName.setError("Enter Name"); focusOnView(tilName);
            return false;
        } else if(tietEmail.getText().toString().isEmpty()) {
tilEmail.setError("Enter Email"); focusOnView(tilEmail);
            return false;
        } else if(tietContactNo.getText().toString().isEmpty()) {
tilContactNo.setError("Enter Contact no"); focusOnView(tilContactNo);
            return false;
        } else if(rgGender.getCheckedRadioButtonId() == -1) {
Toast.makeText(context, "Select Gender", Toast.LENGTH_SHORT).show();
focusOnView(rgGender);
            return false;
        } else {
            return true;
        }
    }

    public void focusOnView(final View view) {
        svRegistrationForm.post(new Runnable() {
            @Override
            public void run() {
                svRegistrationForm.smoothScrollTo(0, view.getTop()-50);
            }
        });

    }

}
```

MainActivity.java

```
package com.example.employeedetails;

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_first);
    }
}
```

ModelforUsers.java

```java
package com.example.employeedetails;

public class ModelForUsers {

    String id, name, email, contactNo, gender;

    public String getId() {
        return id;
    }

    public void setId(String id) {
        this.id = id;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public String getEmail() {
        return email;
    }

    public void setEmail(String email) {
        this.email = email;
    }

    public String getContactNo() {
        return contactNo;
    }

    public void setContactNo(String contactNo) {
        this.contactNo = contactNo;
    }

    public String getGender() {
        return gender;
    }

    public void setGender(String gender) {
        this.gender = gender;
    }
}
```

SecondActivity.java

```java
package com.example.employeedetails;

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

import android.content.Context;
import android.content.Intent;
import android.database.Cursor;
import android.os.Bundle;
import android.view.View;
```

```
import android.widget.ListView;
import android.widget.TextView;

import java.util.ArrayList;
public class SecondActivity extends AppCompatActivity
{
    Context context;
    DatabaseHelper databaseHelper;

    ArrayList<ModelForUsers> userList = new ArrayList();
    RecyclerView rvUserDetails;
    RecyclerView.Adapter adapter; TextView tvMessage;

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

        context = SecondActivity.this;

        databaseHelper = new DatabaseHelper(context);

        rvUserDetails = findViewById(R.id.rv_user_details);
        tvMessage = findViewById(R.id.tv_message);

        Cursor cursor = databaseHelper.getAllUserDetails();
        if(cursor.getCount() == 0) {
            tvMessage.setVisibility(View.VISIBLE);
        } else {
            tvMessage.setVisibility(View.GONE); while (cursor.moveToNext())
{
                ModelForUsers user = new ModelForUsers();
                user.setId(cursor.getString(0));
                user.setName(cursor.getString(1));
                user.setEmail(cursor.getString(2));
                user.setContactNo(cursor.getString(3));
                user.setGender(cursor.getString(4));
                userList.add(user);
            }

            rvUserDetails.setHasFixedSize(true);
            rvUserDetails.setLayoutManager(new LinearLayoutManager(this));
            adapter = new UserRecyclerViewAdapter(context, userList);
            rvUserDetails.setAdapter(adapter);
        }

    }
}
```

UserRecyclerViewAdaptor.java

```
package com.example.employeedetails;

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 UserRecyclerViewAdapter extends
RecyclerView.Adapter<UserRecyclerViewAdapter.UserRecyclerViewHolder> {

        Context context;
        ArrayList<ModelForUsers> usersList;

        public UserRecyclerViewAdapter(Context context,
ArrayList<ModelForUsers> usersList) {
            this.context = context;
            this.usersList = usersList;
        }
    @NonNull @Override
    public UserRecyclerViewHolder onCreateViewHolder(@NonNull ViewGroup
parent, int viewType)
    {
        LayoutInflater layoutInflater =
LayoutInflater.from(parent.getContext());
        View view = layoutInflater.inflate(R.layout.row_user, parent,
false);
        UserRecyclerViewHolder userRecyclerViewHolder = new
UserRecyclerViewHolder(view);
        return userRecyclerViewHolder;
    }

    @Override
    public void onBindViewHolder(@NonNull UserRecyclerViewHolder
userRecyclerViewHolder, int position) {
        userRecyclerViewHolder.tvId.setText("Id: " +
usersList.get(position).getId());
        userRecyclerViewHolder.tvName.setText("Name: " +
usersList.get(position).getName());
        userRecyclerViewHolder.tvEmail.setText("Email: " +
usersList.get(position).getEmail());
        userRecyclerViewHolder.tvContactNo.setText("Contact No: " +
usersList.get(position).getContactNo());
        userRecyclerViewHolder.tvGender.setText("Gender: " +
usersList.get(position).getGender());
    }

    @Override
    public int getItemCount() {
        return usersList.size();
    }
    class UserRecyclerViewHolder extends RecyclerView.ViewHolder
    {
        TextView tvId, tvName, tvEmail, tvContactNo, tvGender;
        public UserRecyclerViewHolder(@NonNull View itemView) {
            super(itemView);

            tvId = itemView.findViewById(R.id.tv_id);
            tvName = itemView.findViewById(R.id.tv_name);
            tvEmail = itemView.findViewById(R.id.tv_email);
            tvContactNo = itemView.findViewById(R.id.tv_contact_no);
            tvGender = itemView.findViewById(R.id.tv_gender);
        }
    }
}
```

AndroidManifest.java

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

    <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.EmployeeDetails">
        <activity android:name=".FirstActivity"

            android:screenOrientation="portrait"
            android:theme="@style/Theme.EmployeeDetails">
        <intent-filter>
            <action android:name="android.intent.action.MAIN" />

            <category android:name="android.intent.category.LAUNCHER" />
        </intent-filter>
        </activity>
        <activity android:name=".SecondActivity"
            android:screenOrientation="portrait"
            android:theme="@style/Theme.EmployeeDetails"/>
        <activity android:name=".MainActivity">

        </activity>
    </application>

</manifest>
```

**Output:**


31% 9:41 PM
EmployeeDetails
Id: 1
Name: pradnesh
Email: pradnesh@gmail.com
Contact No: 1234567890
Gender: Male
Id: 2
Name: pradnesh
Email: pezgj@gkh.com
Contact No: 86500
Gender: Male
Id: 3
Name: pradnesh
Email: pradnesh@gmail.com
Contact No: 123456789
Gender: Male


78% 11:26 PM
EmployeeDetails
Gender: Male
Id: 2
Name: pradnesh
Email: pezgj@gkh.com
Contact No: 86500
Gender: Male
Id: 3
Name: pradnesh
Email: pradnesh@gmail.com
Contact No: 123456789
Gender: Male
Id: 4
Name: abc
Email: abc@gmail.com
Contact No: 5248709631
Gender: Female

**Experiment 5**

**Aim:** Implement EMI calculator using Android

**Theory:**

-Open eclipse or android studio and create new project
-Select our project in the project explorer
-Go to res folder and select layout Double click the main xml file
-Type the code for main.xml or drag and drop various components used in our program
-Drag and drop relative layout and change its properties
-Drag and drop image view and change its properties according to our programs
-Screen layout can be viewed by clicking graphics layout tab
-Include necessary files
-Override OnCreate() function
-Create Image view and initialize its using id of some components used in the xml program
-Save the program
-Run the program
-Output can be viewed in the android emulator

**Program:**

MainActivity.java

```
package com.example.emicalculator;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;

import android.text.TextUtils;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
public class MainActivity extends AppCompatActivity {

    Button emiCalcBtn;

    @Override

    protected void onCreate(Bundle savedInstanceState) {

        super.onCreate(savedInstanceState);

        setContentView(R.layout.activity_main);
        final EditText P = (EditText)findViewById(R.id.principal);
        final EditText I = (EditText)findViewById(R.id.interest);
        final EditText Y = (EditText)findViewById(R.id.years);
        final EditText result = (EditText)findViewById(R.id.emi) ;
        emiCalcBtn = (Button) findViewById(R.id.btn_calculate2);
        emiCalcBtn.setOnClickListener(new View.OnClickListener() {

            @Override
```

```
        public void onClick(View v) {

            String st1 = P.getText().toString();

            String st2 = I.getText().toString();

            String st3 = Y.getText().toString();

            if (TextUtils.isEmpty(st1)) {
                P.setError("Enter Prncipal Amount");

                P.requestFocus();

                return;

            }

            if (TextUtils.isEmpty(st2)) {
                I.setError("Enter Interest Rate");

                I.requestFocus();

                return;

            }

            if (TextUtils.isEmpty(st3)) {
                Y.setError("Enter Years");

                Y.requestFocus();

                return;

            }

            float p = Float.parseFloat(st1);

            float i = Float.parseFloat(st2);
            float y = Float.parseFloat(st3);
            float Principal = calPric(p);

            float Rate = calInt(i);

            float Months = calMonth(y);

            float Dvdnt = calDvdnt( Rate, Months);

            float FD = calFinalDvdnt (Principal, Rate, Dvdnt);

            float D = calDivider(Dvdnt);

            float emi = calEmi(FD, D);

            result.setText(String.valueOf(emi));
        }

    });

}
```

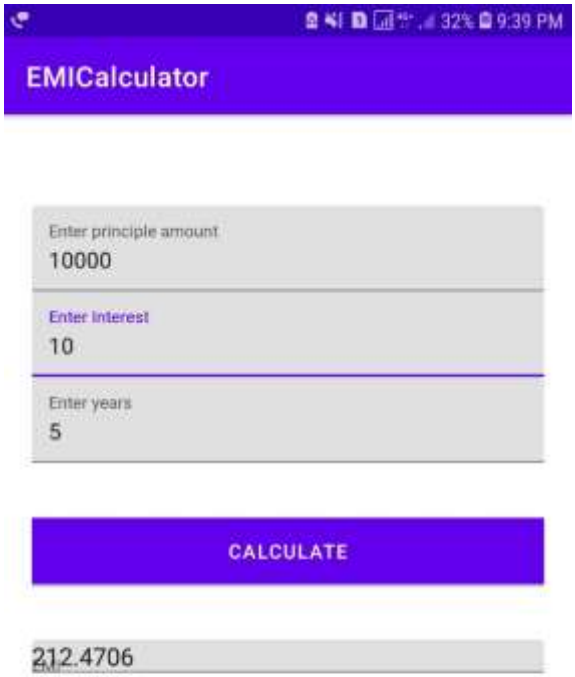
```
    public float calPric(float p) {

        return (float) (p);

    }

    public float calInt(float i) {

        return (float) (i/12/100);

    }

    public float calMonth(float y) {

        return (float) (y * 12);

    }

    public float calDvdnt(float Rate, float Months) {

        return (float) (Math.pow(1+Rate, Months));
    }

    public float calFinalDvdnt(float Principal, float Rate, float Dvdnt) {

        return (float) (Principal * Rate * Dvdnt);

    }

    public float calDivider(float Dvdnt) {

        return (float) (Dvdnt-1);

    }

    public float calEmi(float FD, Float D) {

        return (float) (FD/D);

    }

}
```

AndroidManifest.xml

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

    <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.EMICalculator">
        <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>
```

**Output:**



**Experiment 6**

**Aim:** Write an application that creates an alert on receiving a message

**Theory:**

-Open eclipse or android studio and create new project
-Select our project in the project explorer
-Go to res folder and select layout Double click the main xml file
-Type the code for main.xml or drag and drop various components used in our program
-Drag and drop relative layout and change its properties
-Drag and drop image view and change its properties according to our programs
-Screen layout can be viewed by clicking graphics layout tab
-Include necessary files
-Override OnCreate() function
-Create Image view and initialize its using id of some components used in the xml program
-Save the program
-Run the program
-Output can be viewed in the android emulator

**Program**

**MainActivity.java**

```
package com.example.exp6_alert;

import android.app.Notification;
import android.app.NotificationManager;
import android.app.PendingIntent;
import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;

import androidx.appcompat.app.AppCompatActivity;

public class MainActivity extends AppCompatActivity
{
    Button notify;
    EditText e;
    @Override
    protected void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        notify= (Button) findViewById(R.id.button);
        e= (EditText) findViewById(R.id.editText);

        notify.setOnClickListener(new View.OnClickListener()
        {
```

```
            @Override
            public void onClick(View v)
            {
                Intent intent = new Intent(MainActivity.this,
SecondActivity.class);
                PendingIntent pending =
PendingIntent.getActivity(MainActivity.this, 0, intent, 0);
                Notification noti = new
Notification.Builder(MainActivity.this).setContentTitle("New
Message").setContentText(e.getText().toString()).setSmallIcon(R.mipmap.ic_l
auncher).setContentIntent(pending).build();
                NotificationManager manager = (NotificationManager)
getSystemService(NOTIFICATION_SERVICE);
                noti.flags |= Notification.FLAG_AUTO_CANCEL;
                manager.notify(0, noti);
            }
        });
    }
}
```

SecondActivity.java

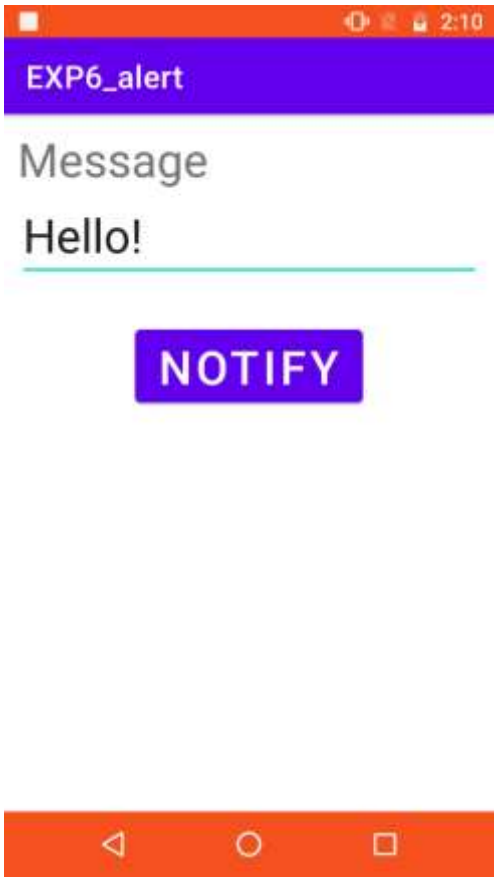
```
package com.example.exp6_alert;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;

public class SecondActivity extends AppCompatActivity {

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

**activity_main.xml**

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.exp6_alert">

    <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.EXP6_alert">
        <activity android:name=".SecondActivity"></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**




**Experiment 7**

**Aim:** Implement Basic Calculator using Android

**Theory:**

-Open eclipse or android studio and create new project
-Select our project in the project explorer
-Go to res folder and select layout Double click the main xml file
-Type the code for main.xml or drag and drop various components used in our program
-Drag and drop relative layout and change its properties
-Drag and drop image view and change its properties according to our programs
-Screen layout can be viewed by clicking graphics layout tab
-Include necessary files
-Override OnCreate() function
-Create Image view and initialize its using id of some components used in the xml program
-Save the program
-Run the program
-Output can be viewed in the android emulator

**Program**

**MainActivity.java**

```
package com.example.basiccalcmcc;
import androidx.appcompat.app.AppCompatActivity;

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

public class MainActivity extends AppCompatActivity {

    private Button zero;
    private Button one;
    private Button two;
    private Button three;
    private Button four;
    private Button five;
    private Button six;
    private Button seven;
    private Button eight;
    private Button nine;
    private Button add;
    private Button sub;
    private Button mul;
    private Button divide;
    private Button equal;
    private Button clear;
    private TextView info;
    private TextView result;
```

```
    private final char ADDITION = '+';
    private final char SUBTRACTION = '-';
    private final char MULTIPLICATION = '*';
    private final char DIVISION = '/';
    private final char EQU = 0;
    private double val1 = Double.NaN;
    private double val2;
    private char ACTION;

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

        setupUIViews();

        zero.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                info.setText(info.getText().toString() + "0");
            }
        });

        one.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                info.setText(info.getText().toString() + "1");
            }
        });
        two.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                info.setText(info.getText().toString() + "2");
            }
        });
        three.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                info.setText(info.getText().toString() + "3");
            }
        });
        four.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                info.setText(info.getText().toString() + "4");
            }
        });
        five.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                info.setText(info.getText().toString() + "5");
            }
        });
        six.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                info.setText(info.getText().toString() + "6");
            }
        });
        seven.setOnClickListener(new View.OnClickListener() {
            @Override
```

```
            public void onClick(View v) {
                info.setText(info.getText().toString() + "7");
            }
        });
        eight.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                info.setText(info.getText().toString() + "8");
            }
        });
        nine.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                info.setText(info.getText().toString() + "9");
            }
        });

        add.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                compute();
                ACTION = ADDITION;
                result.setText(String.valueOf(val1) + "+");
                info.setText(null);
            }
        });
        sub.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                compute();
                ACTION = SUBTRACTION;
                result.setText(String.valueOf(val1) + "-");
                info.setText(null);
            }
        });
        mul.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                compute();
                ACTION = MULTIPLICATION;
                result.setText(String.valueOf(val1) + "*");
                info.setText(null);
            }
        });
        divide.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                compute();
                ACTION = DIVISION;
                result.setText(String.valueOf(val1) + "/");
                info.setText(null);
            }
        });
        equal.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                compute();
                ACTION = EQU;
                result.setText(result.getText().toString() +
String.valueOf(val2) + "=" + String.valueOf(val1));
                //5 + 4 = 9
```

```
                info.setText(null);
            }
        });
        clear.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                if (info.getText().length() > 0) {
                    CharSequence name = info.getText().toString();
                    info.setText(name.subSequence(0, name.length() - 1));

                }
                else{
                    val1 = Double.NaN;
                    val2 = Double.NaN;
                    info.setText(null);
                    result.setText(null);
                }
            }
        });

    }
    private void setupUIViews(){
        zero = (Button)findViewById(R.id.btnZero);
        one = (Button)findViewById(R.id.btnOne);
        two = (Button)findViewById(R.id.btnTwo);
        three = (Button)findViewById(R.id.btnThree);
        four = (Button)findViewById(R.id.btnFour);
        five = (Button)findViewById(R.id.btnFive);
        six = (Button)findViewById(R.id.btnSix);
        seven = (Button)findViewById(R.id.btnSeven);
        eight = (Button)findViewById(R.id.btnEight);
        nine = (Button)findViewById(R.id.btnNine);
        add = (Button)findViewById(R.id.btnAdd);
        sub = (Button)findViewById(R.id.btnSub);
        mul = (Button)findViewById(R.id.btnMulti);
        divide = (Button)findViewById(R.id.btnDivide);
        equal = (Button)findViewById(R.id.btnEqual) ;
        info = (TextView) findViewById(R.id.tvControl);
        result = (TextView) findViewById(R.id.tvResult);
        clear = (Button)findViewById(R.id.btnClear);

    }
    private void compute(){
        if (!Double.isNaN(val1)){
            val2 = Double.parseDouble(info.getText().toString());

            switch (ACTION){
                case ADDITION:
                    val1 = val1 + val2;
                    break;
                case SUBTRACTION:
                    val1 = val1 - val2;
                    break;
                case MULTIPLICATION:
                    val1 = val1 * val2;
                    break;
                case DIVISION:
                    val1 = val1 / val2;
                    break;
                case EQU:
                    break;
```

```
            }
        }
        else {
            val1 = Double.parseDouble(info.getText().toString());
        }
    }
}
```

**activity_main.xml**

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

    <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.Basiccalcmcc">
        <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>
```

**Output**


**Experiment 8**

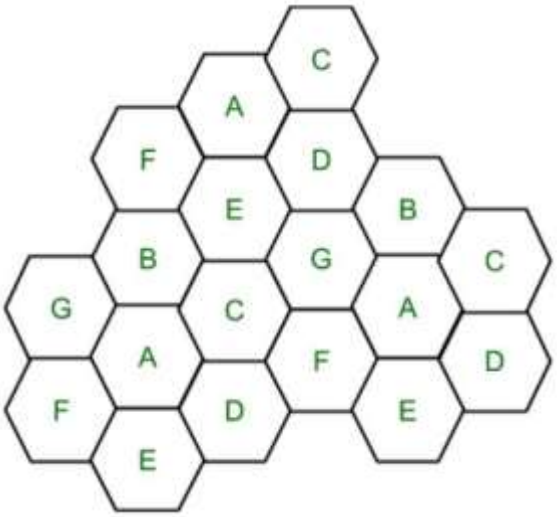
**Aim:** Write a program to demonstrate Cellular Frequency Reuse

**Theory:**

**Frequency Reuse** is the scheme in which allocation and reuse of channels throughout a coverage region is done. Each cellular base station is allocated a group of radio channels or Frequency sub-bands to be used within a small geographic area known as a cell. The shape of the cell is Hexagonal. The process of selecting and allocating the frequency sub-bands for all of the cellular base station within a system is called Frequency reuse or Frequency Planning.

**Silent Features of using Frequency Reuse:**

- Frequency reuse improve the spectral efficiency and signal Quality (QoS).
- Frequency reuse classical scheme proposed for GSM systems offers a protection against interference.
- The number of times a frequency can be reused is depend on the tolerance capacity of the radio channel from the nearby transmitter that is using the same frequencies.
- In Frequency Reuse scheme, total bandwidth is divided into different sub-bands that are used by cells.
- Frequency reuse scheme allow WiMax system operators to reuse the same frequencies at different cell sites.




Cell with the same letter uses the same set of channels group or frequencies sub-band.

To find the total number of channel allocated to a cell:

S = Total number of duplex channels available to use
k = Channels allocated to each cell (k<S)
N = Total number of cells or Cluster Size

Then Total number of channels (S) will be,

S = kN

Frequency Reuse Factor = 1/N

In the above diagram cluster size is 7 (A,B,C,D,E,F,G) thus frequency reuse factor is 1/7.

N is the number of cells which collectively use the complete set of available frequencies is called a Cluster. The value of N is calculated by the following formula:

$N = I^2 + I*J + J^2$
Where **I**,**J** = 0,1,2,3…
Hence, possible values of N are 1,3,4,7,9,12,13,16,19 and so on.
If a Cluster is replicated or repeated M times within the cellular system, then Capacity, C, will be,

C = MkN = MS

In Frequency reuse there are several cells that use the same set of frequencies. These cells are called Co-Channel Cells. These Co-Channel cells results in interference. So to avoid the Interference cells that use the same set of channels or frequencies are separated from one another by a larger distance. The distance between any two Co-Channels can be calculated by the following formula:

$D = R * (3 * N)^{1/2}$
Where,
R = Radius of a cell
N = Number of cells in a given cluster

**Program:**

```
#!/usr/bin/python

from math import *

# import everything from Tkinter module
from tkinter import *

# Base class for Hexagon shape
class Hexagon(object):
   def __init__(self, parent, x, y, length, color, tags):
      self.parent = parent
      self.x = x
      self.y = y
      self.length = length
      self.color = color
      self.size = None
      self.tags = tags
      self.draw_hex()

   # draw one hexagon
   def draw_hex(self):
      start_x = self.x
      start_y = self.y
```

```
        angle = 60
        coords = []
        for i in range(6):
            end_x = start_x + self.length * cos(radians(angle * i))
            end_y = start_y + self.length * sin(radians(angle * i))
            coords.append([start_x, start_y])
            start_x = end_x
            start_y = end_y
        self.parent.create_polygon(coords[0][0],
                                   coords[0][1],
                                   coords[1][0],
                                   coords[1][1],
                                   coords[2][0],
                                   coords[2][1],
                                   coords[3][0],
                                   coords[3][1],
                                   coords[4][0],
                                   coords[4][1],
                                   coords[5][0],
                                   coords[5][1],
                                   fill=self.color,
                                   outline="black",
                                   tags=self.tags)

# class holds frequency reuse logic and related methods
class FrequencyReuse(Tk):
    CANVAS_WIDTH = 800
    CANVAS_HEIGHT = 650
    TOP_LEFT = (20, 20)
    BOTTOM_LEFT = (790, 560)
    TOP_RIGHT = (780, 20)
    BOTTOM_RIGHT = (780, 560)

    def __init__(self, cluster_size, columns=16, rows=10, edge_len=30):
        Tk.__init__(self)
        self.textbox = None
        self.curr_angle = 330
        self.first_click = True
        self.reset = False
        self.edge_len = edge_len
        self.cluster_size = cluster_size
        self.reuse_list = []
        self.all_selected = False
        self.curr_count = 0
        self.hexagons = []
        self.co_cell_endp = []
        self.reuse_xy = []
        self.canvas = Canvas(self,
                             width=self.CANVAS_WIDTH,
                             height=self.CANVAS_HEIGHT,
                             bg="#4dd0e1")
        self.canvas.bind("<Button-1>", self.call_back)
        self.canvas.focus_set()
        self.canvas.bind('<Shift-R>', self.resets)
        self.canvas.pack()
        self.title("Frequency reuse and co-channel selection")
        self.create_grid(16, 10)
        self.create_textbox()
        self.cluster_reuse_calc()

    # show lines joining all co-channel cells
```

```
    def show_lines(self):
        # center(x,y) of first hexagon
        approx_center = self.co_cell_endp[0]
        self.line_ids = []
        for k in range(1, len(self.co_cell_endp)):

            end_xx = (self.co_cell_endp[k])[0]
            end_yy = (self.co_cell_endp[k])[1]

            # move i^th steps
            l_id = self.canvas.create_line(approx_center[0], approx_center[1],
                                           end_xx, end_yy)
            if j == 0:
                self.line_ids.append(l_id)
                dist = 0
            elif i >= j and j != 0:
                self.line_ids.append(l_id)
                dist = j
                # rotate counter-clockwise and move j^th step
                l_id = self.canvas.create_line(
                    end_xx, end_yy, end_xx + self.center_dist * dist *
                    cos(radians(self.curr_angle - 60)),
                    end_yy + self.center_dist * dist *
                    sin(radians(self.curr_angle - 60)))
                self.line_ids.append(l_id)
            self.curr_angle -= 60

    def create_textbox(self):
        txt = Text(self.canvas,
                   width=80,
                   height=1,
                   font=("Helvatica", 12),
                   padx=10,
                   pady=10)
        txt.tag_configure("center", justify="center")
        txt.insert("1.0", "Select a Hexagon")
        txt.tag_add("center", "1.0", "end")
        self.canvas.create_window((0, 600), anchor='w', window=txt)
        txt.config(state=DISABLED)
        self.textbox = txt

    def resets(self, event):
        if event.char == 'R':
            self.reset_grid()

    # clear hexagonal grid for new i/p
    def reset_grid(self, button_reset=False):
        self.first_click = True
        self.curr_angle = 330
        self.curr_count = 0
        self.co_cell_endp = []
        self.reuse_list = []
        for i in self.hexagons:
            self.canvas.itemconfigure(i.tags, fill=i.color)

        try:
            self.line_ids
        except AttributeError:
            pass
        else:
            for i in self.line_ids:
```

```
            self.canvas.after(0, self.canvas.delete, i)
        self.line_ids = []

    if button_reset:
        self.write_text("Select a Hexagon")

# create a grid of Hexagons
def create_grid(self, cols, rows):
    size = self.edge_len
    for c in range(cols):
        if c % 2 == 0:
            offset = 0
        else:
            offset = size * sqrt(3) / 2
        for r in range(rows):
            x = c * (self.edge_len * 1.5) + 50
            y = (r * (self.edge_len * sqrt(3))) + offset + 15
            hx = Hexagon(self.canvas, x, y, self.edge_len, "#fafafa",
                     "{},{}".format(r, c))
            self.hexagons.append(hx)

# calculate reuse distance, center distance and radius of the hexagon
def cluster_reuse_calc(self):
    self.hex_radius = sqrt(3) / 2 * self.edge_len
    self.center_dist = sqrt(3) * self.hex_radius
    self.reuse_dist = self.hex_radius * sqrt(3 * self.cluster_size)

def write_text(self, text):
    self.textbox.config(state=NORMAL)
    self.textbox.delete('1.0', END)
    self.textbox.insert('1.0', text, "center")
    self.textbox.config(state=DISABLED)

#check if the co-channels are within visible canvas
def is_within_bound(self, coords):
    if self.TOP_LEFT[0] < coords[0] < self.BOTTOM_RIGHT[0] \
    and self.TOP_RIGHT[1] < coords[1] < self.BOTTOM_RIGHT[1]:
        return True
    return False

#gets called when user selects a hexagon
#This function applies frequency reuse logic in order to
#figure out the positions of the co-channels
def call_back(self, evt):

    selected_hex_id = self.canvas.find_closest(evt.x, evt.y)[0]
    hexagon = self.hexagons[int(selected_hex_id - 1)]
    s_x, s_y = hexagon.x, hexagon.y
    approx_center = (s_x + 15, s_y + 25)

    if self.first_click:
        self.first_click = False
        self.write_text(
            """Now, select another hexagon such
            that it should be a co-cell of
            the original hexagon."""
        )
        self.co_cell_endp.append(approx_center)
        self.canvas.itemconfigure(hexagon.tags, fill="green")

        for _ in range(6):
```

```
            end_xx = approx_center[0] + self.center_dist * i * cos(
               radians(self.curr_angle))
            end_yy = approx_center[1] + self.center_dist * i * sin(
               radians(self.curr_angle))

            reuse_x = end_xx + (self.center_dist * j) * cos(
               radians(self.curr_angle - 60))
            reuse_y = end_yy + (self.center_dist * j) * sin(
               radians(self.curr_angle - 60))

            if not self.is_within_bound((reuse_x, reuse_y)):
               self.write_text(
                  """co-cells are exceeding canvas boundary.
                  Select cell in the center"""
               )
               self.reset_grid()
               break

            if j == 0:
               self.reuse_list.append(
                  self.canvas.find_closest(end_xx, end_yy)[0])
            elif i >= j and j != 0:
               self.reuse_list.append(
                  self.canvas.find_closest(reuse_x, reuse_y)[0])

            self.co_cell_endp.append((end_xx, end_yy))
            self.curr_angle -= 60

      else:
         curr = self.canvas.find_closest(s_x, s_y)[0]
         if curr in self.reuse_list:
            self.canvas.itemconfigure(hexagon.tags, fill="green")
            self.write_text("Correct! Cell {} is a co-cell.".format(
               hexagon.tags))
            if self.curr_count == len(self.reuse_list) - 1:
               self.write_text("Great! Press Shift-R to restart")
               self.show_lines()
            self.curr_count += 1

         else:
            self.write_text("Incorrect! Cell {} is not a co-cell.".format(
               hexagon.tags))
            self.canvas.itemconfigure(hexagon.tags, fill="red")

if __name__ == '__main__':
   print(
      """Enter i & j values. common (i,j) values are:
      (1,0), (1,1), (2,0), (2,1), (3,0), (2,2)"""
   )
   i = int(input("Enter i: "))
   j = int(input("Enter j: "))
   if i == 0 and j == 0:
      raise ValueError("i & j both cannot be zero")
   elif j > i:
      raise ValueError("value of j cannot be greater than i")
   else:
      N = (i**2 + i * j + j**2)
      print("N is {}".format(N))
   freqreuse = FrequencyReuse(cluster_size=N)
   freqreuse.mainloop()
```

Output:

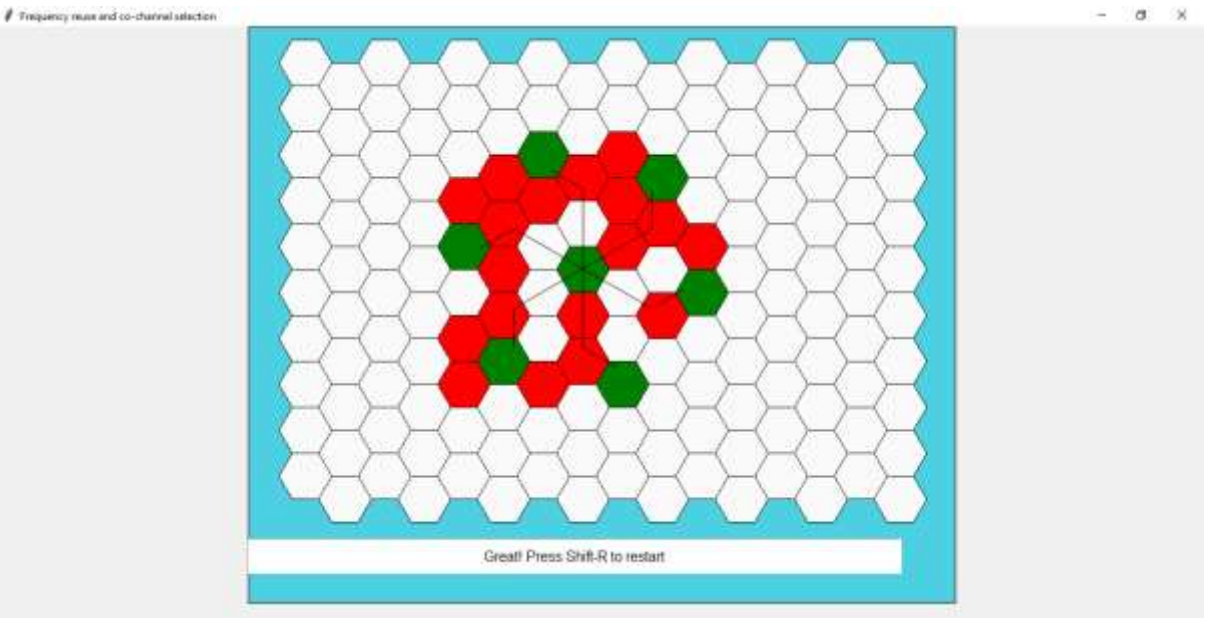
Enter i & j values. common (i,j) values are:

(1,0), (1,1), (2,0), (2,1), (3,0), (2,2)

Enter i: 2

Enter j: 1

N is 7



**Experiment 9**

**Aim:** Write Android application to write data to SD card

**Theory:**

-Open eclipse or android studio and create new project
-Select our project in the project explorer
-Go to res folder and select layout Double click the main xml file
-Type the code for main.xml or drag and drop various components used in our program
-Drag and drop relative layout and change its properties
-Drag and drop image view and change its properties according to our programs
-Screen layout can be viewed by clicking graphics layout tab
-Include necessary files
-Override OnCreate() function
-Create Image view and initialize its using id of some components used in the xml program
-Save the program
-Run the program
-Output can be viewed in the android emulator

## Program

```
package com.example.anew;

import android.Manifest;
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 androidx.appcompat.app.AppCompatActivity;
import androidx.core.app.ActivityCompat;
import java.io.BufferedReader;
import java.io.File;
import java.io.FileNotFoundException;
import java.io.FileOutputStream;
import java.io.FileReader;
import java.io.IOException;

public class MainActivity extends AppCompatActivity {

    // Declare the View object references
    Button btnSave, btnLoad;
    EditText etInput;
    TextView tvLoad;
    // Define some String variables, initialized with empty string
    String filename = "";
    String filepath = "";
    String fileContent = "";

    @Override
```

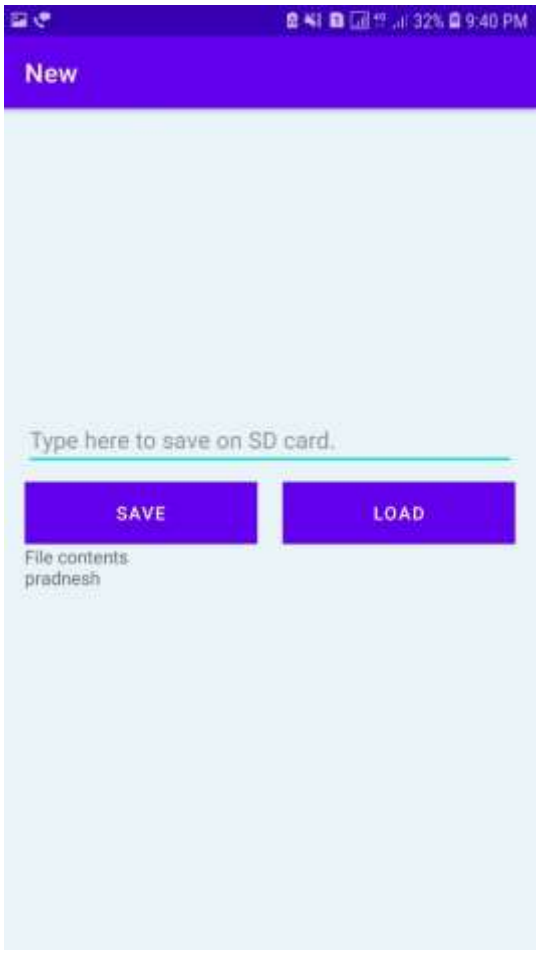
```
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        // Get handles for the views
        btnSave = findViewById(R.id.btnSave);
        btnLoad = findViewById(R.id.btnLoad);
        etInput = findViewById(R.id.etInput);
        tvLoad = findViewById(R.id.tvLoad);
        // Initialize two String variables for storing filename and
filepath
        filename = "myFile.txt";
        filepath = "MyFileDir";
        // Since external storage stays on the physical device that the
user can remove, you need to
        // check if the external storage is available and is not read only
before you try to read
        // from or write to external storage. If the condition is not true
then make the
        // save button disabled.
        if(!isExternalStorageAvailableForRW()){
            btnSave.setEnabled(false);
        }
        // Attach OnClickListener with save button
        btnSave.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                // Clear the TextView tvLoad
                tvLoad.setText("");
                // Get the input from EditText
                fileContent = etInput.getText().toString().trim();
                // Check for Storage Permission
                if(isStoragePermissionGranted()){
                    // If input is not empty, we'll proceed
                    if(!fileContent.equals("")){
                        // To access app-specific files from external
storage, you can call
                        // getExternalFilesDir() method. It returns the
path to
                        // storage > emulated > 0 > Android > data >
[package_name] > files > MyFileDir
                        // or,
                        // storage > self > Android > data > [package_name]
> files > MyFileDir
                        // directory on the SD card. Once the app is
uninstalled files here also get
                        // deleted.
                        // Create a File object like this.
                        File myExternalFile = new
File(getExternalFilesDir(filepath), filename);
                        // Create an object of FileOutputStream for writing
data to myFile.txt
                        FileOutputStream fos = null;
                        try {
                            // Instantiate the FileOutputStream object and
pass myExternalFile in constructor
                            fos = new FileOutputStream(myExternalFile);
                            // Write to the file
                            fos.write(fileContent.getBytes());
                            // Close the stream
                            fos.close();
                        } catch (FileNotFoundException e) {
```

```
                            e.printStackTrace();
                        } catch (IOException e) {
                            e.printStackTrace();
                        }
                        // Clear the EditText
                        etInput.setText("");
                        // Show a Toast message to inform the user that the
operation has been successfully completed.
                        Toast.makeText(MainActivity.this, "Information
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();
                    }
                }
                /*
                if(!fileContent.equals("")){
                    File myExternalFile = new
File(getExternalFilesDir(filepath), filename);
                    FileOutputStream fos = null;
                    try {
                        fos = new FileOutputStream(myExternalFile);
                        fos.write(fileContent.getBytes());
                    } catch (FileNotFoundException e) {
                        e.printStackTrace();
                    } catch (IOException e) {
                        e.printStackTrace();
                    }
                    etInput.setText("");
                    Toast.makeText(MainActivity.this, "Information saved to
SD card.", Toast.LENGTH_SHORT).show();
                }else{
                    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) {
                // Create a FileReader object reference. FileReader is
typically suitable for reading
                // streams of characters.
                // For reading streams of raw bytes, you can use a
FileInputStream.
                FileReader fr = null;
                File myExternalFile = new
File(getExternalFilesDir(filepath), filename);
                // Instantiate a StringBuilder object. This class is an
alternative to String Class
                // and it is mutable, has methods such as append(),
insert(), or replace() that allow to
                // modify strings. Hence it is more efficient.
                StringBuilder stringBuilder = new StringBuilder();
                try {
                    // Instantiate the FileReader object and pass
myExternalFile in the constructor
                    fr = new FileReader(myExternalFile);
```

```
                    // Instantiate a BufferedReader object and pass
FileReader object in constructor.
                    // The BufferedReader maintains an internal buffer and
can be used with different
                    // types of readers to read text from an Input stream
more efficiently.
                    BufferedReader br = new BufferedReader(fr);
                    // Next, call readLine() method on BufferedReader
object to read a line of text.
                    String line = br.readLine();
                    // Use a while loop to read the entire file
                    while(line != null){
                        // Append the line read to StringBuilder object.
Also, append a new-line
                        stringBuilder.append(line).append('\n');
                        // Again read the next line and store in variable
line
                        line = br.readLine();
                    }
                } catch (FileNotFoundException e) {
                    e.printStackTrace();
                } catch (IOException e) {
                    e.printStackTrace();
                } finally {
                    // Convert the StringBuilder content into String and
add text "File contents\n"
                    // at the beginning.
                    String fileContents = "File contents\n" +
stringBuilder.toString();
                    // Set the TextView with fileContents
                    tvLoad.setText(fileContents);
                }
            }
        });
    }

    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[]{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
```

```
        // Environment.getExternalStorageState() method. If the returned
state is MEDIA_MOUNTED,
        // 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;
    }
}
```

## Output

**Experiment 10**

**Aim:** Write a program to implementA3 GSM Security Algorithm

**Theory:**

The A3 ciphering algorithm is used to authenticate each mobile by verifying the user password within the SIM with the cryptographic key at the MSC. The A5 ciphering algorithm is used for encryption. It provides scrambling for 114 coded bits sent in each TS. The A8 is used for ciphering key.

The subscriber needs to be authenticated before he can use the services provided by the GSM. The Authentication is based on the SIM, that stores the authentication key K, User identification IMSI and theA3Algorithm.

The authentication uses a challenge-response mechanism. The mobile station (MS)signs into the network. The access control (AC) generates a random number RAND as a challenge, and the SIM within the MS answers with the SRES (Signed Response) as the response. The AUC (Authentication Centre) generates the random values of RAND, the signal response SRES and the cipher key Kc. This information is forwarded to the HLR (HomeLocationRegister). The VLR (VisitorLocationRegister) requests the values of RAND, SRES and Kc from the HLR.

The RAND value generated is sent to the SIM by VLR. The same operation is performed on both sides the network and the subscriber module between 128 bit RAND and 128 bit Ki called A3. on both sides the 32 bit SRES is generated, SRES generated by the SIM is sent to the VLR by the MS. VLR then compares both SRES generated, if both are found to be the same, the subscriber is authenticated otherwise rejected.

**Program:**

```
package sem7;
import java.io.*;
import java.lang.Math;
class a3{
static int[] GenereateBits()
{
	int a[] = new int[16];

	for(int i = 0; i < 16; i++){
		double rand = Math.random();
		if(rand >= 0.5){
			a[i] = 1;
		}
		else{
			a[i] = 0;
		}
	}
return a;
}
static int[] Xor(int a[], int b[], int c[])
{
	int temp[] = new int[16];
	System.out.println("XOR of key and random: \n");
	for(int i=0;i<16;i++)
	{
		if(a[i]==1 && b[i]==1 || a[i]==0 && b[i]==0)
		{
			temp[i]=0;
		}
		else{
```

```
                temp[i]=1;
            }
            System.out.print(temp[i]);
        }
        System.out.print("\n");
        System.out.println("XOR of result1 and barker: \n");
        for(int i=0;i<16;i++)
        {
            if(temp[i]==1 && c[i]==1 || temp[i]==0 && c[i]==0)
            {
                temp[i]=0;
            }
            else{
                temp[i]=1;
            }
            System.out.print(temp[i]);
        }
 return temp;
}
public static void main(String args[]){
        int a[] = new int[16];
        System.out.println("generating the 1st random number");
        a=GenereateBits();
        for(int i = 0; i < 16; i++){
            System.out.print(a[i]);
        }
        System.out.print("\n");
        int b[] = new int[16];
        System.out.println("generating the key identification number");
        b=GenereateBits();
```

```
for(int i = 0; i < 16; i++){
		System.out.print(b[i]);
}
System.out.print("\n");
int c[] = new int[16];
System.out.println("generating the barker code");
c=GenereateBits();
for(int i = 0; i < 16; i++){
		System.out.print(c[i]);
}
System.out.print("\n");
System.out.println("checking for mobile");
int z[] = new int[16];
z=Xor(a,b,c);
System.out.print("\n");
System.out.println("Final XOR");
for(int i = 0; i < 16; i++){
		System.out.print(z[i]);
}
System.out.println("checking for auc");
int z1[] = new int[16];
z1=Xor(a,b,c);
int flag=0;
for(int i = 0; i < 16; i++){
		if(z[i]!=z1[i])
		{
			flag=1;
			break;
		}
}
System.out.print("\n");
```

```
        if(flag==1){
                System.out.print("Authentication Failed");
        }
        else{
                System.out.print("Authenrication Passed");
        }
        System.out.print("\n");
}
}
```

Output:

```
generating the 1st random number
0100000110011111
generating the key identification number
1101011100100010
generating the barker code
1100011000011100
checking for mobile
XOR of key and random:

1001011010111101
XOR of result1 and barker:

0101000010100001
Final XOR
0101000010100001checking for auc
XOR of key and random:

1001011010111101
XOR of result1 and barker:

0101000010100001
Authenrication Passed
```

**Experiment 11**

**Aim:** Write a program to implementA5 GSM Security Algorithm

**Theory:**

A5 is a family of symmetric stream ciphers most famously used as the encryption schemes in GSM 1 and succeeding technologies. The A5algorithms are designed for simple commodity hardware with focus on security and speed. The short key length used in A5 along with other vulnerabilities makes GSM prone to attacks. The architecture and implementation of the algorithms are also flawed and can be abused from not only governments, but adversaries without extensive computational power. The decryption can be done in close to real time. This paper will present the encryption scheme used in the 2G GSM network, the A5/1 algorithm, as well as some of the associated vulnerabilities

**Program:**

```
package sem7;


import java.io.*;
import java.lang.Math;
class a5{
	static int[] GenereateBits()
	{
		int a[] = new int[16];


		for(int i = 0; i < 16; i++){
			double rand = Math.random();
			if(rand >= 0.5){
				a[i] = 1;
			}
			else{
				a[i] = 0;
			}
		}
	return a;
}
static int[] Xor(int a[], int b[], int c[])
```

```
{
        int temp[] = new int[16];
        System.out.println("XOR of result and random number: \n");

        for(int i=0;i<16;i++)
        {
                if(a[i]==1 && b[i]==1 || a[i]==0 && b[i]==0)
                {
                        temp[i]=0;
                }
                else{
                        temp[i]=1;
                }

                System.out.print(temp[i]);
}
        System.out.print("\n");
        System.out.println("XOR of reult2 and barker code: \n");

        for(int i=0;i<16;i++)
        {
                if(temp[i]==1 && c[i]==1 || temp[i]==0 && c[i]==0)
                {
                        temp[i]=0;
                }
                else{
                        temp[i]=1;
                }

                System.out.print(temp[i]);
}
```

```
 return temp;

}
static int[] And(int a[], int b[])
{
	int temp[] = new int[16];
	System.out.println("and of 1st key and 2nd key is: \n");

	for(int i=0;i<16;i++)
	{
		if(a[i]==1 && b[i]==1)
		{
			temp[i]=1;
		}
		else{
			temp[i]=0;
		}
		System.out.print(temp[i]);
	}
	System.out.print("\n");

	return temp;
}
public static void main(String args[]){
	int a[] = new int[16];

	System.out.println("generating the 1st key identification number");
	a=GenereateBits();

	for(int i = 0; i < 16; i++){
```

```
            System.out.print(a[i]);
}
System.out.print("\n");
int b[] = new int[16];
System.out.println("generating the 2nd key identification number");
b=GenereateBits();

for(int i = 0; i < 16; i++){
            System.out.print(b[i]);
}
System.out.print("\n");
int c[] = new int[16];
System.out.println("generating the random number");
c=GenereateBits();

for(int i = 0; i < 16; i++){
            System.out.print(c[i]);

}
System.out.print("\n");

int d[] = new int[16];
System.out.println("generating the barker code");

d=GenereateBits();

for(int i = 0; i < 16; i++){
            System.out.print(d[i]);
}
System.out.print("\n");
```

```
int z[] = new int[16];
z=And(a,b);
int p[]=new int[16];
p=Xor(z,c,d);

System.out.print("\n");
System.out.println("Final answer");
for(int i = 0; i < 16; i++){
        System.out.print(p[i]);
}

int z1[] = new int[16];
z1=And(a,b);
int p1[]=new int[16];
p1=Xor(z,c,d);

System.out.print("\n");
System.out.println("Final answer");
for(int i = 0; i < 16; i++){
        System.out.print(p1[i]);
}
System.out.print("\n");
int flag=0;
for(int i = 0; i < 16; i++){
        if(p[i]!=p1[i])
        {
                flag=1;
                break;
        }
}
if(flag==1){
```

```
                System.out.print("encryption Failed");
        }
        else{
                System.out.print("encryption Passed");
        }
        }
}
```

Output:

```
generating the 1st key identification number
1111001010101001
generating the 2nd key identification number
0001001010000010
generating the random number
0101110011010010
generating the barker code
1101111011100001
and of 1st key and 2nd key is:

0001001010000000
XOR of result and random number:

0100111001010010
XOR of reult2 and barker code:

1001000010110011
Final answer
1001000010110011and of 1st key and 2nd key is:

0001001010000000
XOR of result and random number:

0100111001010010
XOR of reult2 and barker code:

1001000010110011
Final answer
1001000010110011
encryption Passed
```

## Experiment 12

**Aim:** Write a Program to explain concept of DSSS

**Theory:**

Direct Sequence Spread Spectrum (DSSS) signal has been widely used because of its low signal-to-noise ratio, strong anti-interference, low interception rate and multi-path effect. It is gradually replacing the traditional communications, and widely used in modern military and commercial communications systems. Therefore, the corresponding direct-communication communication reconnaissance technology has become an urgent problem to be solved in the field of communication reconnaissance area. In this paper, the auto correlation characteristics of DSSS signal are analyzed and the second-order moment of autocorrelation function is used to improve the performance of DSSS signal. Upon completion of the DSSS detection, can also estimate the DSSS signal pseudo-code period, pseudo-code rate. The algorithm is suitable for low signal-to-noise ratio and has practical application value. Computer simulation results verify the feasibility and practicability of the method.

**Program:**

```
package sem7;
import java.lang.*;
import java.util.*;
class dsss {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.print("Enter input string: ");
      String inputString = scanner.next();

      //System.out.print(inputString.charAt(1))
      String barcaCode = "10110111000";
      // Encryption
      String eOutput = "";
      for (int i = 0; i < inputString.length(); i++) {
```

```
        String a = getString(inputString.charAt(i));
        eOutput = eOutput + getEXOR(a, barcaCode);
    }
    System.out.println("Encrypted message: " + eOutput + "\n");
    // Decryption
    ArrayList<String> enStrings = new ArrayList<String>();
    for (int i = 0; i < eOutput.length(); i = i + 11) {
        enStrings.add(eOutput.substring(i, i + 11));
    }
    String dOutput = "";
    for (int i = 0; i < enStrings.size(); i++) {
        String a = getEXOR(enStrings.get(i), barcaCode);
        if (getNoOfOnes(a) > 7) {
            dOutput = dOutput + "1";
        } else if (getNoOfOnes(a) < 3) {
            dOutput = dOutput + "0";
        }
    }
    System.out.println("Decrypted message: " + dOutput + " \n \n");
}
    /* Method for getting 1111111111 1 or 00000000000 */
    public static String getString(char a){
        if (a == '1') {
            return "11111111111";
        } else
            return "00000000000";
    }
public static String getEXOR(String x, String y) {
    String z = "";
    for (int i = 0; i < x.length(); i++) {
        if ((x.charAt(i) == '1' && y.charAt(i) == '1') || (x.charAt(i) == '0' && y.charAt(i) == '0')) {
```

```
            z = z + "0";
        } else if ((x.charAt(i) == '0' && y.charAt(i) == '1') || (x.charAt(i) == '1' && y.charAt(i) == '0'))
            z = z + "1";
      }
      return z;
   }
   public static int getNoOfOnes(String a) {
      int count = 0;
      for (int i = 0; i < a.length(); i++) {
         if (a.charAt(i) == '1') {
            count = count + 1;
         }
      }
      return count;
   }
}
```

Output:

```
Enter input string: 10010
Encrypted message: 0100100011110110111000101101110000100100011110110111000

Decrypted message: 10010
```