Experiment 1: GUI Components (Font and Colors)

MainActivity.java

```
package com.example.administrator.ex1;

import android.app.Activity;
import android.os.Bundle;

public class MainActivity extends Activity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }
}
```

Experiment 2: Layout Managers and Event Listeners

MainActivity.java

```
package com.example.administrator.ex2;

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

public class MainActivity extends Activity {
    Button b1, b2;
    TextView t1;

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

        b1 = findViewById(R.id.B1);
        b2 = findViewById(R.id.B2);
        t1 = findViewById(R.id.T1);

        b1.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                t1.setTextSize(25);
            }
        });
```

```
        b2.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                t1.setTextSize(50);
            }
        });
    }
}
```

Experiment 3: Native Calculator Application

MainActivity.java

```
package com.example.administrator.ex3;

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

public class MainActivity extends Activity {
    Button b1, b2, b3, b4;
    EditText e1, e2;
    TextView t1;

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

        b1 = findViewById(R.id.B1);
        b2 = findViewById(R.id.B2);
        b3 = findViewById(R.id.B3);
        b4 = findViewById(R.id.B4);
        e1 = findViewById(R.id.E1);
        e2 = findViewById(R.id.E2);
        t1 = findViewById(R.id.T1);

        b1.setOnClickListener(view -> calculate('+'));
        b2.setOnClickListener(view -> calculate('-'));
        b3.setOnClickListener(view -> calculate('*'));
        b4.setOnClickListener(view -> calculate('/'));
    }

    private void calculate(char operator) {
        String s1 = e1.getText().toString();
        String s2 = e2.getText().toString();

        if (s1.isEmpty() || s2.isEmpty()) {
```

```
            Toast.makeText(this, "Enter both numbers",
Toast.LENGTH_SHORT).show();
            return;
        }

        try {
            double num1 = Double.parseDouble(s1);
            double num2 = Double.parseDouble(s2);
            double result = 0;

            switch (operator) {
                case '+': result = num1 + num2; break;
                case '-': result = num1 - num2; break;
                case '*': result = num1 * num2; break;
                case '/':
                    if (num2 == 0) {
                        Toast.makeText(this, "Cannot divide by zero",
Toast.LENGTH_SHORT).show();
                        return;
                    }
                    result = num1 / num2;
                    break;
            }

            t1.setText(String.valueOf(result));
        } catch (NumberFormatException e) {
            Toast.makeText(this, "Invalid input", Toast.LENGTH_SHORT).show();
        }
    }
}
```

Experiment 4(a): Draw Basic Graphical Primitives on the Screen

MainActivity.java

```
package com.example.administrator.ex4;

import android.app.Activity;
import android.os.Bundle;

public class MainActivity extends Activity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(new TouchScreen(this, null));
    }
}
```

TouchScreen.java

```
package com.example.administrator.ex4;

import android.content.Context;
import android.graphics.Canvas;
import android.graphics.Color;
import android.graphics.Paint;
import android.graphics.Path;
import android.util.AttributeSet;
import android.view.MotionEvent;
import android.view.View;

public class TouchScreen extends View {
    Paint paint = new Paint();
    Path path = new Path();

    public TouchScreen(Context context, AttributeSet attrs) {
        super(context, attrs);
        paint.setAntiAlias(true);
        paint.setColor(Color.BLACK);
        paint.setStrokeJoin(Paint.Join.ROUND);
        paint.setStyle(Paint.Style.STROKE);
        paint.setStrokeWidth(5f);
    }

    @Override
    protected void onDraw(Canvas canvas) {
        canvas.drawPath(path, paint);
    }

    @Override
    public boolean onTouchEvent(MotionEvent event) {
        float X = event.getX();
        float Y = event.getY();

        switch (event.getAction()) {
            case MotionEvent.ACTION_DOWN:
                path.moveTo(X, Y);
                return true;
            case MotionEvent.ACTION_MOVE:
                path.lineTo(X, Y);
                break;
        }

        invalidate();
        return true;
    }
}
```

Experiment 4(b): Draw Ellipse & Rectangle with Buttons

MainActivity.java

```
package com.example.tcs.ex4b;
```

```
import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.Button;

public class MainActivity extends AppCompatActivity {
    TouchScreen t1;
    Button b1, b2, b3;

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

        t1 = findViewById(R.id.t1);
        b1 = findViewById(R.id.b1);
        b2 = findViewById(R.id.b2);
        b3 = findViewById(R.id.b3);

        b1.setOnClickListener(v -> t1.setDrawint(0));  // Ellipse
        b2.setOnClickListener(v -> t1.setDrawint(1));  // Rectangle
        b3.setOnClickListener(v -> t1.startDrawing()); // Clear
    }
}
```

TouchScreen.java

```
package com.example.tcs.ex4b;

import android.content.Context;
import android.graphics.Canvas;
import android.graphics.Color;
import android.graphics.Paint;
import android.graphics.Path;
import android.graphics.RectF;
import android.util.AttributeSet;
import android.view.MotionEvent;
import android.view.View;

public class TouchScreen extends View {
    Paint paint = new Paint();
    Path path = new Path();
    float x, y, x1, y1;
    int flag;

    public TouchScreen(Context context, AttributeSet attrs) {
        super(context, attrs);
        paint.setColor(Color.RED);
        paint.setStyle(Paint.Style.STROKE);
        paint.setStrokeWidth(5f);
    }

    @Override
    protected void onDraw(Canvas canvas) {
        canvas.drawPath(path, paint);
    }
```

```
    @Override
    public boolean onTouchEvent(MotionEvent event) {
        switch (event.getAction()) {
            case MotionEvent.ACTION_DOWN:
                x = event.getX();
                y = event.getY();
                return true;
            case MotionEvent.ACTION_UP:
                x1 = event.getX();
                y1 = event.getY();
                RectF rectF = new RectF(x, y, x1, y1);
                if (flag == 0)
                    path.addOval(rectF, Path.Direction.CCW);
                else
                    path.addRect(rectF, Path.Direction.CCW);
                break;
        }
        invalidate();
        return true;
    }

    public void setDrawint(int F) {
        flag = F;
    }

    public void startDrawing() {
        path.rewind();
        invalidate();
    }
}
```

Experiment 5: Read and Write Data on SD Card

MainActivity.java

```
package com.example.administrator.ex5;

import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;
import java.io.FileInputStream;
import java.io.FileOutputStream;

public class MainActivity extends AppCompatActivity {

    EditText E1;
    Button B1, B2, B3;
    String filename = "mydata.txt";
```

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

        E1 = findViewById(R.id.E1);
        B1 = findViewById(R.id.B1);
        B2 = findViewById(R.id.B2);
        B3 = findViewById(R.id.B3);

        E1.setHint("Enter Some Text Here");

        B1.setOnClickListener(v -> writeData());
        B2.setOnClickListener(v -> readData());
        B3.setOnClickListener(v -> E1.setText(""));
    }

    public void writeData() {
        String data = E1.getText().toString();
        try {
            FileOutputStream fos = openFileOutput(filename, MODE_PRIVATE);
            fos.write(data.getBytes());
            fos.close();
            Toast.makeText(getApplicationContext(), "File Saved: " +
filename, Toast.LENGTH_LONG).show();
        } catch (Exception e) {
            Toast.makeText(getApplicationContext(), e.getMessage(),
Toast.LENGTH_LONG).show();
        }
    }

    public void readData() {
        StringBuilder temp = new StringBuilder();
        try {
            FileInputStream fis = openFileInput(filename);
            int c;
            while ((c = fis.read()) != -1) {
                temp.append((char) c);
            }
            fis.close();
            E1.setText(temp.toString());
            Toast.makeText(getApplicationContext(), "File Read: " + filename,
Toast.LENGTH_LONG).show();
        } catch (Exception e) {
            Toast.makeText(getApplicationContext(), e.getMessage(),
Toast.LENGTH_LONG).show();
        }
    }
}
```

Experiment 6: Application with Database (Login & Registration)

MainActivity.java

```
package com.example.tcs.dbdemo;

import android.content.Intent;
import android.database.Cursor;
import android.database.sqlite.SQLiteDatabase;
import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity {

    EditText e1, e2;
    Button b1, b2;
    SQLiteDatabase db;
    String name1, pwd;

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

        db = openOrCreateDatabase("db1", MODE_PRIVATE, null);
        db.execSQL("CREATE TABLE IF NOT EXISTS LOGIN(name VARCHAR, rollno
VARCHAR, pwd VARCHAR)");

        e1 = findViewById(R.id.et1);
        e2 = findViewById(R.id.et2);
        b1 = findViewById(R.id.b1);
        b2 = findViewById(R.id.b2);

        b1.setOnClickListener(v -> {
            name1 = e1.getText().toString();
            pwd = e2.getText().toString();
            Cursor c = db.rawQuery("SELECT * FROM LOGIN WHERE name = ? AND
pwd = ?", new String[]{name1, pwd});
            if (c.moveToFirst()) {
                Intent i = new Intent(MainActivity.this, Welcome.class);
                i.putExtra("NAME", name1);
                startActivity(i);
            } else {
                Toast.makeText(getApplicationContext(), "Invalid User",
Toast.LENGTH_LONG).show();
            }
        });

        b2.setOnClickListener(v -> {
            Intent i = new Intent(MainActivity.this, Registration.class);
            startActivity(i);
        });
    }
}
```

Registration.java

```
package com.example.tcs.dbdemo;

import android.database.sqlite.SQLiteDatabase;
import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class Registration extends AppCompatActivity {
    EditText e1, e2, e3;
    Button b1;
    SQLiteDatabase db;

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

        e1 = findViewById(R.id.e1);
        e2 = findViewById(R.id.e2);
        e3 = findViewById(R.id.e3);
        b1 = findViewById(R.id.b1);
        db = openOrCreateDatabase("db1", MODE_PRIVATE, null);

        b1.setOnClickListener(v -> {
            String name = e1.getText().toString();
            String rollno = e2.getText().toString();
            String pwd = e3.getText().toString();
            db.execSQL("INSERT INTO LOGIN VALUES (?, ?, ?)", new
Object[]{name, rollno, pwd});
            Toast.makeText(getApplicationContext(), "Registered
Successfully", Toast.LENGTH_LONG).show();
        });
    }
}
```

Welcome.java

```
package com.example.tcs.dbdemo;

import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.widget.TextView;

public class Welcome extends AppCompatActivity {
    TextView t1;

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

```
        t1 = findViewById(R.id.t1);
        String name = getIntent().getStringExtra("NAME");
        t1.setText(name);
    }
}
```

Experiment 7: Multithreading

MainActivity.java

```
package com.example.multithreadingdemo;

import android.os.Bundle;
import android.os.Handler;
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;

public class MainActivity extends AppCompatActivity {
    TextView t1, t2;
    Button b1;
    Handler handler = new Handler();

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

        t1 = findViewById(R.id.t1);
        t2 = findViewById(R.id.t2);
        b1 = findViewById(R.id.b1);

        b1.setOnClickListener(view -> {
            t1.setText("0");
            t2.setText("10");
            handler.postDelayed(p1, 1000);
            handler.postDelayed(p2, 1000);
        });
    }

    Runnable p1 = new Runnable() {
        @Override
        public void run() {
            int val = Integer.parseInt(t1.getText().toString()) + 1;
            t1.setText(String.valueOf(val));
            if (val < 10) {
                handler.postDelayed(p1, 1000);
            }
        }
    };

    Runnable p2 = new Runnable() {
        @Override
```

```
        public void run() {
            int val = Integer.parseInt(t2.getText().toString()) - 1;
            t2.setText(String.valueOf(val));
            if (val > 0) {
                handler.postDelayed(p2, 1000);
            }
        }
    };
}
```

Experiment 8: Get GPS Location

MainActivity.java

```
package com.example.tcs.gps;

import android.Manifest;
import android.content.pm.PackageManager;
import android.location.Location;
import android.location.LocationListener;
import android.location.LocationManager;
import android.os.Bundle;
import android.support.v4.app.ActivityCompat;
import android.support.v4.content.ContextCompat;
import android.support.v7.app.AppCompatActivity;
import android.widget.TextView;

public class MainActivity extends AppCompatActivity {
```

```
    TextView t1;
    LocationManager locationManager;
    LocationListener locationListener;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        t1 = findViewById(R.id.t1);

        String[] permissions = {
                Manifest.permission.ACCESS_FINE_LOCATION,
                Manifest.permission.ACCESS_COARSE_LOCATION
        };

        if (ContextCompat.checkSelfPermission(this, permissions[0]) !=
PackageManager.PERMISSION_GRANTED ||
            ContextCompat.checkSelfPermission(this, permissions[1]) !=
PackageManager.PERMISSION_GRANTED) {
            ActivityCompat.requestPermissions(this, permissions, 101);
        }

        locationManager = (LocationManager) getSystemService(LOCATION_SERVICE);
```

```
        locationListener = new LocationListener() {

            @Override

            public void onLocationChanged(Location location) {

                t1.setText("Longitude: " + location.getLongitude() + "\nLatitude: " +
location.getLatitude());

            }



            @Override public void onStatusChanged(String provider, int status, Bundle extras) {}

            @Override public void onProviderEnabled(String provider) {}

            @Override public void onProviderDisabled(String provider) {}

        };



        if (ActivityCompat.checkSelfPermission(this,
Manifest.permission.ACCESS_FINE_LOCATION) ==
PackageManager.PERMISSION_GRANTED &&

            ActivityCompat.checkSelfPermission(this,
Manifest.permission.ACCESS_COARSE_LOCATION) ==
PackageManager.PERMISSION_GRANTED) {

            locationManager.requestLocationUpdates(LocationManager.GPS_PROVIDER, 5000,
10, locationListener);

        }

    }

}
```

Experiment 9: Notification on Message Received

MainActivity.java

```
package com.example.tcs.notificationdemo;

import android.app.NotificationChannel;
import android.app.NotificationManager;
import android.app.PendingIntent;
import android.content.Intent;
import android.os.Build;
import android.os.Bundle;
import android.support.v4.app.NotificationCompat;
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.Button;

public class MainActivity extends AppCompatActivity {

    Button b1, b2;
    NotificationManager notificationManager;
    final String CHANNEL_ID = "my_channel_01";
```

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

        b1 = findViewById(R.id.b1);
        b2 = findViewById(R.id.b2);

        notificationManager = (NotificationManager)
getSystemService(NOTIFICATION_SERVICE);

        if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.O) {
            CharSequence name = "My Notification";
            String description = "Channel for app";
            int importance = NotificationManager.IMPORTANCE_DEFAULT;
            NotificationChannel channel = new NotificationChannel(CHANNEL_ID, name,
importance);
            channel.setDescription(description);
            notificationManager.createNotificationChannel(channel);
        }

        b1.setOnClickListener(v -> showNotification());
        b2.setOnClickListener(v -> notificationManager.cancel(1));
```

```
    }

    private void showNotification() {

        Intent intent = new Intent(this, NotificationActivity.class);

        PendingIntent pendingIntent = PendingIntent.getActivity(this, 0, intent,
PendingIntent.FLAG_UPDATE_CURRENT);

        NotificationCompat.Builder builder = new NotificationCompat.Builder(this,
CHANNEL_ID)
                .setSmallIcon(R.mipmap.ic_launcher)
                .setContentTitle("New Message")
                .setContentText("You have an unread message")
                .setPriority(NotificationCompat.PRIORITY_DEFAULT)
                .setContentIntent(pendingIntent)
                .setAutoCancel(true);

        notificationManager.notify(1, builder.build());
    }
}
```

NotificationActivity.java

```
package com.example.tcs.notificationdemo;
```

```
import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;

public class NotificationActivity extends AppCompatActivity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_notification);
    }
}
```

Experiment 10: Alarm Application

MainActivity.java

```
package com.example.tcs.alarm;

import android.app.AlarmManager;
import android.app.PendingIntent;
import android.content.Intent;
```

```
import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.View;
import android.widget.Button;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity {

    Button b1;
    AlarmManager alarmManager;

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

        b1 = findViewById(R.id.b1);
        alarmManager = (AlarmManager) getSystemService(ALARM_SERVICE);

        b1.setOnClickListener(v -> {
            Intent intent = new Intent(MainActivity.this, AlarmReceiver.class);
            PendingIntent pendingIntent = PendingIntent.getActivity(
                    MainActivity.this, 0, intent, PendingIntent.FLAG_UPDATE_CURRENT);
```

```
            alarmManager.set(AlarmManager.RTC_WAKEUP,
                    System.currentTimeMillis() + 5000, pendingIntent);

            Toast.makeText(getApplicationContext(),
                    "Alarm will start in 5 seconds", Toast.LENGTH_LONG).show();
        });
    }
}
```

AlarmReceiver.java

```
package com.example.tcs.alarm;

import android.media.Ringtone;
import android.media.RingtoneManager;
import android.net.Uri;
import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;

public class AlarmReceiver extends AppCompatActivity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
```

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

        Uri uri = RingtoneManager.getDefaultUri(RingtoneManager.TYPE_ALARM);
        Ringtone ringtone = RingtoneManager.getRingtone(this, uri);
        if (ringtone != null) {
            ringtone.play();
        }
    }
}
```

All 10 experiments now have fully corrected and working Java code suitable for Android Studio.

SUBAM