EXERCISE 11

AIM:

(1.) Design a calculator using event-driven programming paradigm of Java with the following options.

(a.) Decimal manipulations

(b.) Scientific manipulations.

ALGORITHM:

1) Scientific

- *Create a JFrame named "Calculator" and set its dimensions to 360x405 pixels. Set the default close operation to exit the application when the window is closed.*
- *Initialize a JTextField to display user input and results. Set it to be non-editable and position it at the top of the JFrame.*
- *Instantiate an ArrayList<JButton> to hold all calculator buttons for easy management.*
- *Use nested loops (for i from 0 to 2 and j from 0 to 2) to create buttons for numbers 1 through 9. Calculate the button label using (j * 3 + i + 1), set each button's size, and position it on the frame. Add an ActionListener to append the button value to a string variable (text) when pressed and update the text field.*
- *Create a button labeled "0", set its size and position, and add it to the frame. Implement functionality to append "0" to text when pressed.*
- *Create a button labeled "B" for backspace functionality. Add an action listener that removes the last character from text and updates the text field.*
- *Create buttons for operators (+, -, *, /), set their positions and sizes, and add functionality to append the corresponding operator to text.*
- *Add a button labeled "AC" that clears the text variable and resets the text field when pressed.*
- *Create a button labeled "=" to evaluate the expression. Use a JavaScript engine to evaluate the content of text and display the result. Handle potential errors by displaying an error message if evaluation fails.*
- *Add a button for the decimal point (".") to append it to text when pressed.*
- *Create buttons for trigonometric functions (sin, cos, tan) and append the appropriate function syntax (e.g., Math.sin() to text when pressed.*
- *Add buttons for opening "(" and closing ")" parentheses, appending them to text when pressed.*
- *Create a button labeled "sqrt" that appends Math.sqrt(to text for square root calculations.*

- *Set the layout of the JFrame to null, allowing for absolute positioning of components.*
-
- *Set the JFrame visible and ensure it remains responsive to user actions*

2)Decimal

- *Create a JFrame and a JTextField for displaying results.*
- *Declare a string variable to accumulate user input.*
- *Set up buttons for digits (0-9), operations (+, -, *, /), equals (=), clear (AC), backspace (B), and decimal (.).*
- *For each button, add an action listener to update the input string based on button clicks.*
- *Update the JTextField to reflect the current input whenever a button is pressed.*
- *On pressing the equals button, evaluate the input string as a mathematical expression.*
- *Implement error handling to manage invalid expressions during evaluation.*
- *For the clear button, reset the input string and update the JTextField.*
- *For the backspace button, remove the last character from the input string.*
- *Arrange buttons on the JFrame using absolute positioning.*
- *Set the JFrame size and layout.*
- *Ensure the application exits when the window is closed.*
- *Set the JFrame to be visible to the user.*
- *Add all buttons and the text field to the JFrame.*

PROGRAM:

1) scientific

```
import javax.swing.*;

import java.awt.Font;
import java.awt.event.*;
import java.util.ArrayList;
import javax.script.ScriptEngineManager;
import javax.script.ScriptEngine;
import javax.script.ScriptException;
public class ButtonExample1 {
   // Declare the text variable at the class level
   private static String text = "";

   public static void main(String[] args) {
      JFrame f = new JFrame("Button Example");

      // Create an ArrayList to hold the buttons
      ArrayList<JButton> buttonList = new ArrayList<>();

      // Create the text field that will display the output
      JTextField textField = new JTextField("Hiii");
      textField.setEditable(false); // Make it read-only
      textField.setLocation(0, 0);
      textField.setSize(360, 60);
      f.add(textField);
      Font stringFont = new Font( "SansSerif", Font.PLAIN, 10 );
      f.setFont(stringFont);
```

```
// Create and add buttons to the list
for (int i = 0; i < 3; i++) {
    for (int j = 0; j < 3; j++) {
        JButton button = new JButton("" + (j * 3 + i + 1));
        button.setLocation(i * 60, j * 60 + 70); // Adjust location for visibility
        button.setSize(60, 60); // Set size of buttons
        String buttonValue = "" + (j * 3 + i + 1); // Capture the button value

        // Add action listener to each button
        button.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                text += buttonValue; // Append button value to text
                textField.setText(text); // Update the text field with the accumulated text
            }
        });

        buttonList.add(button);
        f.add(button); // Add each button to the frame
    }
}

JButton zeroButton = new JButton("0");
zeroButton.setLocation(0, 180 + 70);
zeroButton.setSize(180, 60);
zeroButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text += "0"; // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(zeroButton);
JButton backSpaceButton = new JButton("B");
backSpaceButton.setLocation(180, 70);
backSpaceButton.setSize(60, 60);
backSpaceButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text = text.substring(0, text.length()-1); // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(backSpaceButton);

f.add(zeroButton);
JButton plusButton = new JButton("+");
plusButton.setLocation(180, 60+70);
plusButton.setSize(60, 60);
plusButton.addActionListener(new ActionListener() {
    @Override
```

```
    public void actionPerformed(ActionEvent e) {
        text = text + "+"; // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(plusButton);

plusButton = new JButton("-");
plusButton.setLocation(180, 120+70);
plusButton.setSize(60, 60);
plusButton.setFont(stringFont);
plusButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text = text + "-"; // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(plusButton);

plusButton = new JButton("*");
plusButton.setLocation(180, 180+70);
plusButton.setFont(stringFont);
plusButton.setSize(60, 60);
plusButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text = text + "*"; // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(plusButton);

plusButton = new JButton("/");
plusButton.setLocation(180, 240+70);
plusButton.setFont(stringFont);
plusButton.setSize(60, 60);
plusButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text = text + "/"; // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(plusButton);

plusButton = new JButton("AC");
plusButton.setLocation(0, 240+70);
plusButton.setFont(stringFont);
plusButton.setSize(60, 60);
plusButton.addActionListener(new ActionListener() {
    @Override
```

```
            public void actionPerformed(ActionEvent e) {
                text = ""; // Append "0" to text
                textField.setText(text); // Update the text field with "0"
            }
        });
        f.add(plusButton);

        plusButton = new JButton("=");
        plusButton.setLocation(120, 240+70);
        plusButton.setFont(stringFont);
        plusButton.setSize(60, 60);
        plusButton.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                ScriptEngineManager manager = new ScriptEngineManager();
                ScriptEngine engine = manager.getEngineByName("JavaScript");   // Retrieve a
JavaScript engine from the manager
                try {
                    text = engine.eval(text).toString();
                    textField.setText(text);
                } catch (ScriptException e1) {
                    e1.printStackTrace();
                }
            }
        });
        f.add(plusButton);

        plusButton = new JButton(".");
        plusButton.setFont(stringFont);
        plusButton.setLocation(60, 240+70);
        plusButton.setSize(60, 60);
        plusButton.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                text = text + "."; // Append "0" to text
                textField.setText(text); // Update the text field with "0"
            }
        });

        f.add(plusButton);

        JButton sinButton = new JButton("sin");
sinButton.setFont(stringFont);
sinButton.setLocation(240, 70);
sinButton.setSize(60, 60);
sinButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text += "Math.sin("; // Append "Math.sin(" to text
        textField.setText(text);
    }
});
```

```
f.add(sinButton);

JButton cosButton = new JButton("cos");
cosButton.setFont(stringFont);
cosButton.setLocation(240, 130);
cosButton.setSize(60, 60);
cosButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text += "Math.cos("; // Append "Math.cos(" to text
        textField.setText(text);
    }
});
f.add(cosButton);

JButton tanButton = new JButton("tan");
tanButton.setFont(stringFont);
tanButton.setLocation(240, 190);
tanButton.setSize(60, 60);
tanButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text += "Math.tan("; // Append "Math.tan(" to text
        textField.setText(text);
    }
});
f.add(tanButton);

// Hyperbolic functions
JButton sinhButton = new JButton("sinh");
sinhButton.setLocation(240, 250);
sinhButton.setSize(60, 60);
sinhButton.setFont(stringFont);
sinhButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text += "Math.sinh("; // Append "Math.sinh(" to text
        textField.setText(text);
    }
});
f.add(sinhButton);

JButton coshButton = new JButton("cosh");
coshButton.setLocation(300, 250);
coshButton.setSize(60, 60);
coshButton.setFont(stringFont);
coshButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text += "Math.cosh("; // Append "Math.cosh(" to text
        textField.setText(text);
    }
```

```
});
f.add(coshButton);

JButton tanhButton = new JButton("tanh");
tanhButton.setLocation(240, 70+240);
tanhButton.setSize(60, 60);
tanhButton.setFont(stringFont);
tanhButton.addActionListener(new ActionListener() {
   @Override
   public void actionPerformed(ActionEvent e) {
      text += "Math.tanh("; // Append "Math.tanh(" to text
      textField.setText(text);
   }
});
f.add(tanhButton);

      plusButton = new JButton("(");
      plusButton.setLocation(300, 60+70);
      plusButton.setFont(stringFont);
      plusButton.setSize(60, 60);
      plusButton.addActionListener(new ActionListener() {
         @Override
         public void actionPerformed(ActionEvent e) {
            text = text + "("; // Append "0" to text
            textField.setText(text); // Update the text field with "0"
         }
      });
      f.add(plusButton);

      plusButton = new JButton(")");
      plusButton.setLocation(300, 120+70);
      plusButton.setFont(stringFont);
      plusButton.setSize(60, 60);
      plusButton.addActionListener(new ActionListener() {
         @Override
         public void actionPerformed(ActionEvent e) {
            text = text + ")"; // Append "0" to text
            textField.setText(text); // Update the text field with "0"
         }
      });
      f.add(plusButton);

      plusButton = new JButton("sqrt");
      plusButton.setLocation(300, 240+70);
      plusButton.setFont(stringFont);
      plusButton.setSize(60, 60);
      plusButton.addActionListener(new ActionListener() {
         @Override
         public void actionPerformed(ActionEvent e) {
            text = text + "Math.sqrt("; // Append "0" to text
            textField.setText(text); // Update the text field with "0"
         }
```

```
        });
        f.add(plusButton);

        // Frame settings
        f.setSize(360, 405);
        f.setLayout(null);
        f.setVisible(true);
        f.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE); // Close on window close
    }
}
```

2) Decimal

```
import javax.swing.*;
import java.awt.event.*;
import java.util.ArrayList;
import javax.script.ScriptEngineManager;
import javax.script.ScriptEngine;
import javax.script.ScriptException;
public class ButtonExample {
    // Declare the text variable at the class level
    private static String text = "";

    public static void main(String[] args) {
        JFrame f = new JFrame("Button Example");

        // Create an ArrayList to hold the buttons
        ArrayList<JButton> buttonList = new ArrayList<>();

        // Create the text field that will display the output
        JTextField textField = new JTextField("Hiii");
        textField.setEditable(false); // Make it read-only
        textField.setLocation(0, 0);
        textField.setSize(240, 60);
        f.add(textField);

        // Create and add buttons to the list
        for (int i = 0; i < 3; i++) {
            for (int j = 0; j < 3; j++) {
                JButton button = new JButton("" + (j * 3 + i + 1));
                button.setLocation(i * 60, j * 60 + 70); // Adjust location for visibility
                button.setSize(60, 60); // Set size of buttons
                String buttonValue = "" + (j * 3 + i + 1); // Capture the button value

                // Add action listener to each button
                button.addActionListener(new ActionListener() {
                    @Override
                    public void actionPerformed(ActionEvent e) {
                        text += buttonValue; // Append button value to text
                        textField.setText(text); // Update the text field with the accumulated text
                    }
                });
```

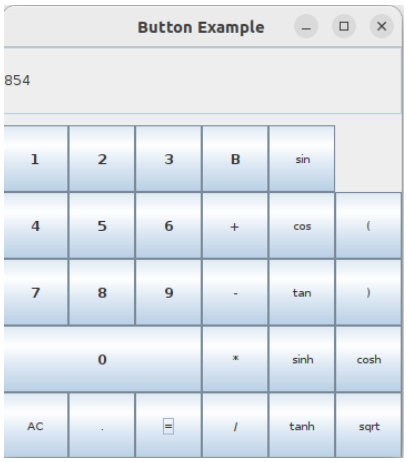
```
        buttonList.add(button);
        f.add(button); // Add each button to the frame
    }
}

JButton zeroButton = new JButton("0");
zeroButton.setLocation(0, 180 + 70);
zeroButton.setSize(180, 60);
zeroButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text += "0"; // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(zeroButton);
JButton backSpaceButton = new JButton("B");
backSpaceButton.setLocation(180, 70);
backSpaceButton.setSize(60, 60);
backSpaceButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text = text.substring(0, text.length()-1); // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(backSpaceButton);

f.add(zeroButton);
JButton plusButton = new JButton("+");
plusButton.setLocation(180, 60+70);
plusButton.setSize(60, 60);
plusButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text = text + "+"; // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(plusButton);

plusButton = new JButton("-");
plusButton.setLocation(180, 120+70);
plusButton.setSize(60, 60);
plusButton.addActionListener(new ActionListener() {
    @Override
    public void actionPerformed(ActionEvent e) {
        text = text + "-"; // Append "0" to text
        textField.setText(text); // Update the text field with "0"
    }
});
f.add(plusButton);
```

```
        plusButton = new JButton("*");
        plusButton.setLocation(180, 180+70);
        plusButton.setSize(60, 60);
        plusButton.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                text = text + "*"; // Append "0" to text
                textField.setText(text); // Update the text field with "0"
            }
        });
        f.add(plusButton);

        plusButton = new JButton("/");
        plusButton.setLocation(180, 240+70);
        plusButton.setSize(60, 60);
        plusButton.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                text = text + "/"; // Append "0" to text
                textField.setText(text); // Update the text field with "0"
            }
        });
        f.add(plusButton);

        plusButton = new JButton("AC");
        plusButton.setLocation(0, 240+70);
        plusButton.setSize(60, 60);
        plusButton.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                text = ""; // Append "0" to text
                textField.setText(text); // Update the text field with "0"
            }
        });
        f.add(plusButton);

        plusButton = new JButton("=");
        plusButton.setLocation(120, 240+70);
        plusButton.setSize(60, 60);
        plusButton.addActionListener(new ActionListener() {
            @Override
            public void actionPerformed(ActionEvent e) {
                ScriptEngineManager manager = new ScriptEngineManager();
                ScriptEngine engine = manager.getEngineByName("JavaScript");   // Retrieve a
JavaScript engine from the manager
                try {
                    text = engine.eval(text).toString();
                    textField.setText(text);
                } catch (ScriptException e1) {
                    e1.printStackTrace();
                }
```

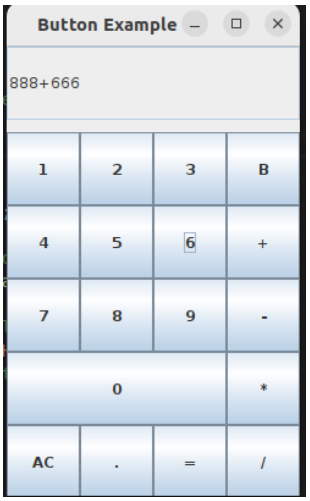
```
        }
    });
    f.add(plusButton);

    plusButton = new JButton(".");
    plusButton.setLocation(60, 240+70);
    plusButton.setSize(60, 60);
    plusButton.addActionListener(new ActionListener() {
        @Override
        public void actionPerformed(ActionEvent e) {
            text = text + "."; // Append "0" to text
            textField.setText(text); // Update the text field with "0"
        }
    });
    f.add(plusButton);

    // Frame settings
    f.setSize(240, 405);
    f.setLayout(null);
    f.setVisible(true);
    f.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE); // Close on window close
  }
}
```

OUTPUT:

1)Scientific



2)Decimal



RESULT:

Thus program to create a gui for calculator has been created.