SOFTWARE TOOLS AND TECHNOLOGY
Lab Notebook

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY

GROUP-21, TEAM MEMBERS:-

- Name : SUPARNA KARMAKAR(Lead) Roll No: 30054623008 , Reg no: 233002410560, Dept: Bsc in IT(AI),
- GIT LINK- https://github.com/suparnakarmakar004/GROUP-21.git
- Name :SUJAL GUPTA, Roll No: 30059223048, Reg no: 233002410052, Dept: Bsc in Forensic Science
- GIT LINK -https://github.com/DreadfullJail18
- Name :ADITYA NARAYAN HAMBIR , Roll No: 30059223034, Reg no: 233002420038, Dept: Bsc in Foresic Science
- GIT LINK-https://github.com/Aditya-2005-Hambir
- Name:SNEHA TALAPATRA,Roll no: 30084323019 Reg no: 233002410618,Dept: Bsc in IT(DS)
- GIT LINK-https://github.com/Snehatalapatra
- Name:BISWAJIT NASKAR,Roll no: 30001223014 , Reg no: 233001010488 ,Dept: BCA
- GIT LINK-https://github.com/Biswajit213

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1. C Program: Basic Calculator

```c
// Basic Calculator Program in C

#include <stdio.h>

int main() {
    char operator;
    double num1, num2, result;

    // Input operator
    printf("Enter an operator (+, -, *, /): ");
    scanf("%c", &operator);

    // Input two numbers
    printf("Enter two numbers: ");
    scanf("%lf %lf", &num1, &num2);

    // Perform the appropriate calculation
    switch (operator) {
        case '+':
            result = num1 + num2;
            printf("%.2lf + %.2lf = %.2lf\n", num1, num2, result);
            break;
        case '-':
            result = num1 - num2;
            printf("%.2lf - %.2lf = %.2lf\n", num1, num2, result);
            break;
        case '*':
            result = num1 * num2;
            printf("%.2lf * %.2lf = %.2lf\n", num1, num2, result);
            break;
        case '/':
            if (num2 != 0) {
                result = num1 / num2;
                printf("%.2lf / %.2lf = %.2lf\n", num1, num2,
                    result);
            } else {
                printf("Error! Division by zero.\n");
            }
            break;
        default:
            printf("Invalid operator.\n");
            break;
    }

    return 0;
}
```

Java Swing Application: SymbolApp

This document describes the Java Swing application named `SymbolApp`. The application showcases a simple "mind-reading" trick by displaying a grid of symbols and revealing a selected symbol based on user interaction. This document is formatted using LaTeX to provide a clear and professional presentation for academic purposes.

1. Clone the Repository

The first step involved cloning the repository from the URL: https://github.com/GeekAyan/STT using GitHub Desktop. I opened GitHub Desktop and navigated to the "File" menu. From there, I selected "Clone Repository" and pasted the URL into the corresponding field. After specifying my local directory where the repository would be cloned, I clicked "Clone" to download the project files onto my local machine. This provided access to the source code and all project dependencies.

2. Set Up the Project

Next, I opened the project in Visual Studio Code (VSCode), a versatile code editor. The setup process involved reading through the `README.md` file, which provided detailed instructions for running the application. The instructions guided me through several steps, including:

- Installing any required dependencies using a package manager such as Maven or Gradle, depending on the project's setup.
- Ensuring that I had the correct version of Java Development Kit (JDK) installed.
- Setting up any required environment variables for the application to run properly.

I followed these steps to ensure my development environment was correctly configured before running the application.

3. Run the Application

Once the project was set up, I proceeded to run the application. The `README.md` provided the necessary commands for building and executing the project. In this case, I used the following command from the terminal:

```
javac SymbolApp.java
java SymbolApp
```

These commands compiled the `SymbolApp.java` file and executed the resulting class file.

4. Modify the Button

The application's user interface includes a button that the user clicks to reveal their "selected" symbol. To personalize and improve the button, I made the following modifications:

- Located the button's code within the `SymbolApp.java` file. The button was initialized using Java's AWT `Button` class and labeled with default text.
- I modified the button's text from its original label to a more engaging phrase: **"Chin Tapak Dum Dum"**.
- This required updating the following line of code:

```
submitButton = new Button("Chin Tapak Dum Dum");
```

  This change improved the interaction with the user by introducing a fun, customized message.

Code Description

The `SymbolApp` class extends `Frame` and implements `ActionListener`, allowing it to respond to user actions like button clicks. It generates a random "special" symbol, which is displayed among other symbols in a 99-symbol grid. The special symbol is placed at multiples of 9. When the user clicks the button, the application reveals the special symbol, creating the illusion that the app has "read" the user's mind and guessed their chosen symbol.

Key Code Modifications

1. The button text was updated to **"Chin Tapak Dum Dum"** to make the user interaction more playful and entertaining.
2. The button's size was modified using `setPreferredSize()`, while the font style was adjusted with `setFont()` to ensure optimal proportions and better readability on the interface.
3. The button's core functionality remained unchanged, allowing users to click it and reveal their selected symbol, maintaining the application's interactive experience.

Java SymbolApp code

[remember picture, overlay] [line width = 2pt, black] ((*currentpage.northwest*)+ (1*cm*, −1*cm*)) rectangle ((*currentpage.southeast*) + (−1*cm*, 1*cm*));

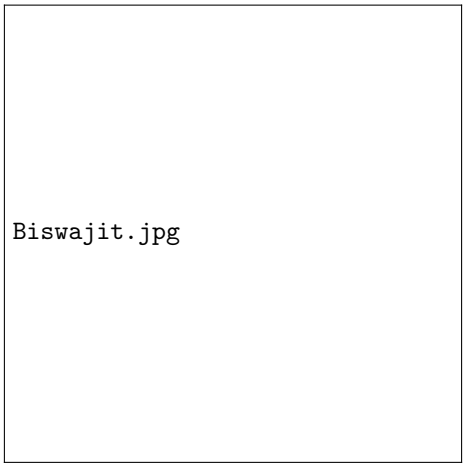
Listing 1: Java Swing Application Code

```
\subsection{Code Listing}
\begin{lstlisting}[language=Java, caption=Java Swing Application Code]
import java.awt.*;
import java.awt.event.*;
import java.util.Random;

public class SymbolApp extends Frame implements ActionListener {
    private Label[] symbolLabels = new Label[99];
    private Button submitButton;
    private String specialSymbol, selectedSymbol;
    public SymbolApp() {
        specialSymbol = Character.toString((char) (new Random().nextInt(94) + 33));
        setLayout(new BorderLayout()); setSize(800, 700); setTitle("Symbol App");
        TextArea instruction = new TextArea(
            "Think of a 2-digit number, reverse it, subtract, then find your symbol below.\n" +
            "I'll guess it! Click the button to see!", 5, 60, TextArea.SCROLLBARS_NONE);
        instruction.setEditable(false); instruction.setFont(new Font("Arial", Font.PLAIN, 16));
        add(instruction, BorderLayout.NORTH);
        Panel symbolPanel = new Panel(new GridLayout(11, 9));
        for (int i = 0; i < 99; i++) {
            String symbol = (i % 9 == 0) ? specialSymbol : Character.toString((char) (33 + (i % 94)));
            symbolLabels[i] = new Label(i + ": " + symbol);
            symbolLabels[i].setAlignment(Label.CENTER);
            symbolPanel.add(symbolLabels[i]);
        }
        add(symbolPanel, BorderLayout.CENTER);
        submitButton = new Button("Chin Tapak Dum Dum");
        submitButton.addActionListener(this);
        add(new Panel().add(submitButton), BorderLayout.SOUTH);

        addWindowListener(new WindowAdapter() {
            public void windowClosing(WindowEvent we) {
                System.exit(0);
            }
        });
        setVisible(true);
    }
    public void actionPerformed(ActionEvent e) {}
    public static void main(String[] args) {
        new SymbolApp();
    }
}
```

LaTeX Document



5 Introduction

5.1 About Me

I am a Biswajit Naskar.I live in west Bengal.Learning on MAKAUT.

5.2 Interests and Hobbies

- Thing 1: e-sport.
- Thing 2: Cricket.
  - My 1st hobbies.
    - I love play e-sport Game.
    - Refrace me.
  - My 2nd hobbies.
    - Healdy Body.
    - My inspiration MS DHONI.

5.3 Favorite Quotations

1. MS DHONI
2. RATAN TATA

6 Mathematics

6.1 Mathematics and Me

Reflection on Experiences with Mathematics

What do I like about mathematics? I appreciate the logical structure and problem-solving aspect of mathematics. It provides a framework to understand the world around us, from the simplest numerical relationships to complex theories. The satisfaction that comes from solving a challenging problem is unparalleled; it feels like putting together the pieces of a puzzle. Additionally, mathematics has a universal language that transcends cultural and linguistic barriers, which is intriguing.

How far would I like to take my study of mathematics? I am eager to explore mathematics further, possibly delving into higher-level topics such as calculus, linear algebra, and statistics. I'd like to apply mathematical concepts to real-world problems, particularly in fields like data science, economics, or engineering. Ultimately, I envision pursuing mathematics at a more advanced level, potentially considering a degree or specialization that allows me to leverage math in practical applications.

What have I enjoyed learning this year in mathematics? This year, I have particularly enjoyed learning about algebra and its applications. The ability to manipulate equations and understand relationships between variables has been enlightening. Additionally, exploring geometry and its principles has been fascinating, especially when applying them to solve problems related to shapes, areas, and volumes. Learning about mathematical modeling and how to represent real-world situations with mathematical expressions has been particularly rewarding.

What have I found the most challenging? The most challenging aspect of my mathematical studies this year has been tackling more abstract concepts, such as functions and their transformations. At times, it can be difficult to visualize how changes in a function's parameters affect its graph and behavior. Additionally, understanding proofs and the logical reasoning behind mathematical concepts has posed challenges, as it requires a different way of thinking compared to simply solving numerical problems. However, these challenges have also been opportunities for growth, pushing me to develop a deeper understanding of the subject.

6.2 Mathematical Notation

Choose a four-digit number which you will use to practice typesetting mathematical expressions. Typeset everything below, including all text just as you see it, substituting your four-digit number in place of the sample number 1972 wherever it occurs (use appropriate values when simplifying the equation in 4(b)).

6.2.1 Superscripts, subscripts, and Greek letters

(a) 21^{72}

(b) $3^{9^{72}}$

(c) 21_{72}

(d) 2_{97_2}

(e) 2472π

(f) $\cos\ \theta$

(g) $\tan^{-1}(2.472)$

(h) $\log_{24} 72$

(i) $\ln 2472$

(j) $e^{2.472}$

(k) $0 < x \leq 2472$

(l) $y \geq 2472$

6.2.2 Roots, fractions, and displaystyle

(a) $\sqrt{1972}$

(b) $\sqrt[10]{72}$

(c) $\dfrac{19}{72}$

(d) $\dfrac{1}{9+\frac{7}{2}}$

(e) $\sqrt{\dfrac{19}{72}}$

7 Tables and Equation Arrays

7.1 Tables and Equation Arrays

1. (a)

x	1	9	9	7
$f(x)$	1	9	9	7

(b)

$$3 + 4 + 9 + 7 = 23$$
$$27 - 12 = 15$$

8 Functions and Formulas

(a) The quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(b) The function $f(x) = \left(x + \frac{2}{4}\right)^2 - \frac{7}{2}$ has domain $D_f : (-\infty, \infty)$ and range $R_f : \left(-\frac{7}{2}, \infty\right)$.

(c) Definition of a Derivative:

$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = f'(x)$$

(d) Chain Rule: $[f(g(x))]' = f'(g(x)) \cdot g'(x)$

(e) $\frac{d^2y}{dx^2} = f''(x)$

(f) $\int \sec^2 x \, dx = \tan x + C$

(g) $\int e^{2x} \, dx = \frac{1}{2} e^{2x} + C$

(h) Fundamental Theorem of Calculus, Part 1: $\int_a^b f'(x) \, dx = f(b) - f(a)$

(i) Fundamental Theorem of Calculus, Part 2: $\frac{d}{dx} \int_a^{g(x)} f(t) \, dt = f(g(x)) \cdot g'(x)$

(j) Euler's Method: $y_1 = y_0 + hF(x_0, y_0)$ where h is the step size, and $F(x, y) = \frac{dy}{dx}$.

(k) $a_n = \left\{1972, \frac{1972}{2}, \frac{1972}{2^2}, \frac{1972}{2^3}, \ldots, \frac{1972}{2^n}\right\}$ represents a geometric sequence.

(l) $S_n = \sum_{n=1}^{\infty} \frac{2472}{2^n}$ is a convergent geometric series since $|r| = \left|\frac{1}{2}\right| < 1$.

(m) Taylor Series: $\sum_{n=0}^{\infty} \frac{f^{(n)}(c)}{n!}(x - c)^n$

(n) Velocity Vector: $\vec{r}(t) = x'(t)\vec{i} + y'(t)\vec{j} = \left\langle \frac{dx}{dt}, \frac{dy}{dt} \right\rangle$

(o) Area of Polar Curve: $A = \frac{1}{2} \int_a^{\beta} r^2 \, d\theta$

Steps to Create My CV

1. Document Setup

I started by selecting the document class as 'article' and set the font size to 10pt on A4 paper. I used the 'geometry' package to adjust the margins to 0.7 inches all around, ensuring a clean and spacious layout.

2. Adding Essential Packages

To enhance the appearance and functionality of my CV, I imported several LaTeX packages:

- `geometry` for controlling the page layout.
- `enumitem` to customize the formatting of lists.
- `hyperref` for adding clickable links to my contact details.
- `xcolor` to define custom colors for text and accents.
- `fontawesome5` to include icons for my email, phone, GitHub, and LinkedIn.

3. Defining Custom Colors

I created custom colors to make my CV visually appealing. I defined a 'headerblue' color for headings, a 'darkgray' color for general text, and an 'accentcolor' to give a modern touch to the underlines in the sections.

4. Formatting Fonts and Section Titles

I chose a sans-serif font for a modern look and formatted the section titles to stand out by making them bold and coloring them blue. Subsections were colored in dark gray and underlined with a light pink accent for consistency.

5. Creating the Header

In the header, I added my name in large text and centered it. Below, I listed my contact details, including email, phone number, GitHub, and LinkedIn, each accompanied by an icon to enhance visual engagement and accessibility.

6. Objective and Sections

I included an objective statement at the top to summarize my skills and aspirations. I then structured sections like “Education,” “Skills,” and “Projects” with clear, bullet-pointed content to effectively highlight my qualifications and experiences.