EXP-2.3

- **AIM:-** To design and develop a full-stack web application that allows users to draw shapes on an SVG canvas using mouse events, and save the drawings using backend APIs.
- **THEORY:-** SVG (Scalable Vector Graphics)
- SVG is an XML-based format for vector graphics that allows shapes like circles, rectangles, lines, and paths to be drawn in the browser with precision and scalability.
- Mouse Events
- Mouse events like mousedown, mousemove, and mouseup allow for capturing user input for drawing shapes or freehand paths.
- Frontend Technologies
- HTML/CSS/JavaScript
- SVG for canvas-like drawing
- Event Listeners for mouse input
- Backend Technologies
- Node.js with Express.js (or Python Flask)
- Database: MongoDB or SQLite (for storing SVG markup or shape data)
- Real-time (optional)
- WebSockets (e.g., Socket.io) for collaborative drawing.
- **CODE:-**
  - **Front-end:**

```
<!DOCTYPE html>
<html lang="en">
<head>
 <meta charset="UTF-8" />
 <title>SVG Drawing Tool</title>
 <style>
  svg {
   border: 1px solid black;
   background: #f9f9f9;
  }
</style>
```

```
</head>
<body>
  <h2>Draw on SVG Canvas</h2>
  <svg id="canvas" width="600" height="400"></svg>
  <button onclick="saveDrawing()">Save Drawing</button>

  <script>
    const svg = document.getElementById('canvas');
    let drawing = false;
    let currentPath;

    svg.addEventListener('mousedown', (e) =>
      { drawing = true;
      const pt = getMousePosition(e);
      currentPath =
document.createElementNS('http://www.w3.org/2000/svg', 'path');
      currentPath.setAttribute('d', `M ${pt.x} ${pt.y}`);
      currentPath.setAttribute('stroke', 'black');
      currentPath.setAttribute('fill', 'none');
      currentPath.setAttribute('stroke-width', '2');
      svg.appendChild(currentPath);
    });

    svg.addEventListener('mousemove', (e) =>
      { if (!drawing) return;
      const pt = getMousePosition(e);
      const d = currentPath.getAttribute('d');
      currentPath.setAttribute('d', `${d} L ${pt.x} ${pt.y}`);
```

```
  });

  svg.addEventListener('mouseup', () =>
    { drawing = false;
  });

  function getMousePosition(evt)
    { const CTM =
    svg.getScreenCTM(); return {
      x: (evt.clientX - CTM.e) / CTM.a,
      y: (evt.clientY - CTM.f) / CTM.d
    };
  }

  function saveDrawing() {
    const svgData = svg.innerHTML;
    fetch('/api/save', {
      method: 'POST',
      headers: { 'Content-Type': 'application/json' },
      body: JSON.stringify({ drawing: svgData })
    }).then(res => res.json())
      .then(data => alert('Drawing saved!'))
      .catch(err => console.error(err));
  }
 </script>
</body>
</html>
```

- **Back-End:**

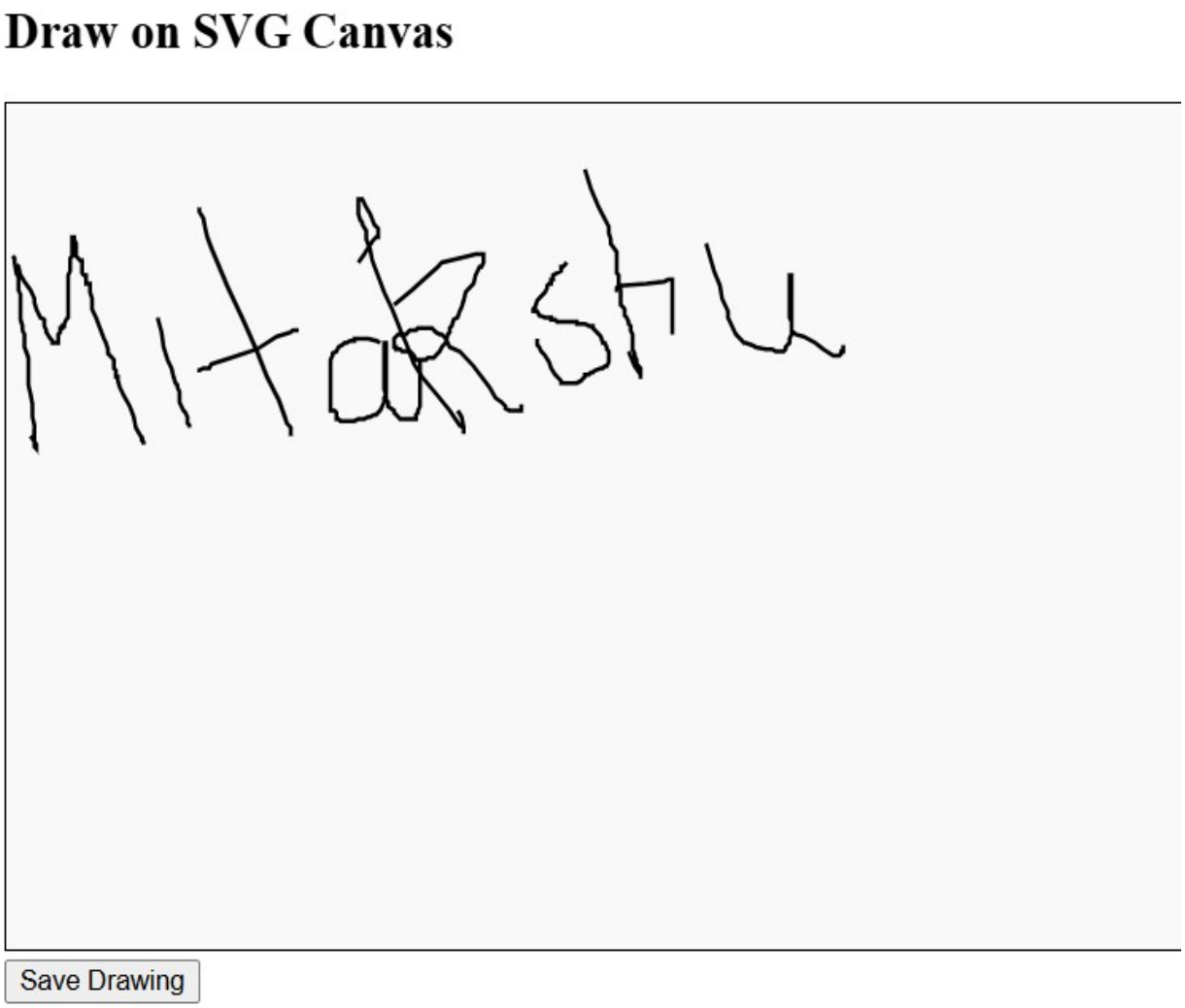
```
// server.js
const express = require('express');
const bodyParser = require('body-parser');
const fs = require('fs');
const app = express();
const PORT = 3000;

app.use(bodyParser.json());
app.use(express.static('public'));

app.post('/api/save', (req, res) =>
  { const { drawing } = req.body;
  fs.writeFile('drawing.svg', `<svg
xmlns="http://www.w3.org/2000/svg" width="600"
height="400">${drawing}</svg>`, (err) => {
    if (err)
      { console.error(err);
      res.status(500).send({ message: 'Failed to save drawing' });
    } else {
      res.send({ message: 'Drawing saved' });
    }
  });
});

app.listen(PORT, () => {
  console.log(`Server running on http://localhost:${PORT}`);
});
```

- **OUTPUT:-**



- **LEARNING OUTCOMES:-**

✓ Interactive Front-End Development – Gained hands-on experience in handling mouse events and dynamically drawing on an SVG canvas using JavaScript.
✓ Client–Server Communication – Learned how to send data from the browser to the backend using the Fetch API and HTTP POST requests.
✓ Back-End Development with Express.js – Understood how to create API endpoints, parse JSON data, and handle requests in Node.js with Express.
✓ File Handling and Data Persistence – Acquired skills in saving user-generated drawings as SVG files using Node's fs module.
✓ Full-Stack Project Integration – Developed a complete workflow connecting front-end drawing, server-side processing, and file storage into a functioning mini web application.