Experiment 5

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Subject Name: Full Stack Development – II **Subject Code: 23CSH-309**

1. **Aim**: To verify the correctness and reliability of the EcoTrack React application by writing automated tests using Jest and React Testing Library, and by analyzing application behavior using debugging tools.

2. **Objective**:

• Understand the purpose of automated testing in frontend applications
• Write unit tests for JavaScript utility functions using Jest
• Use different Jest matchers to validate expected outputs and behaviors
• Test React components using React Testing Library
• Verify UI rendering by querying elements from the DOM
• Implement asynchronous testing using findBy and waitFor methods
• Apply mocking to simulate API or external data responses in tests
• Perform snapshot testing to detect unintended UI changes
• Debug failing tests and application logic using browser Developer Tools and breakpoints
• Analyze application behavior and errors systematically rather than manual checking

3. **Implementation / Code:**

- **Tools & Technologies Used:-**

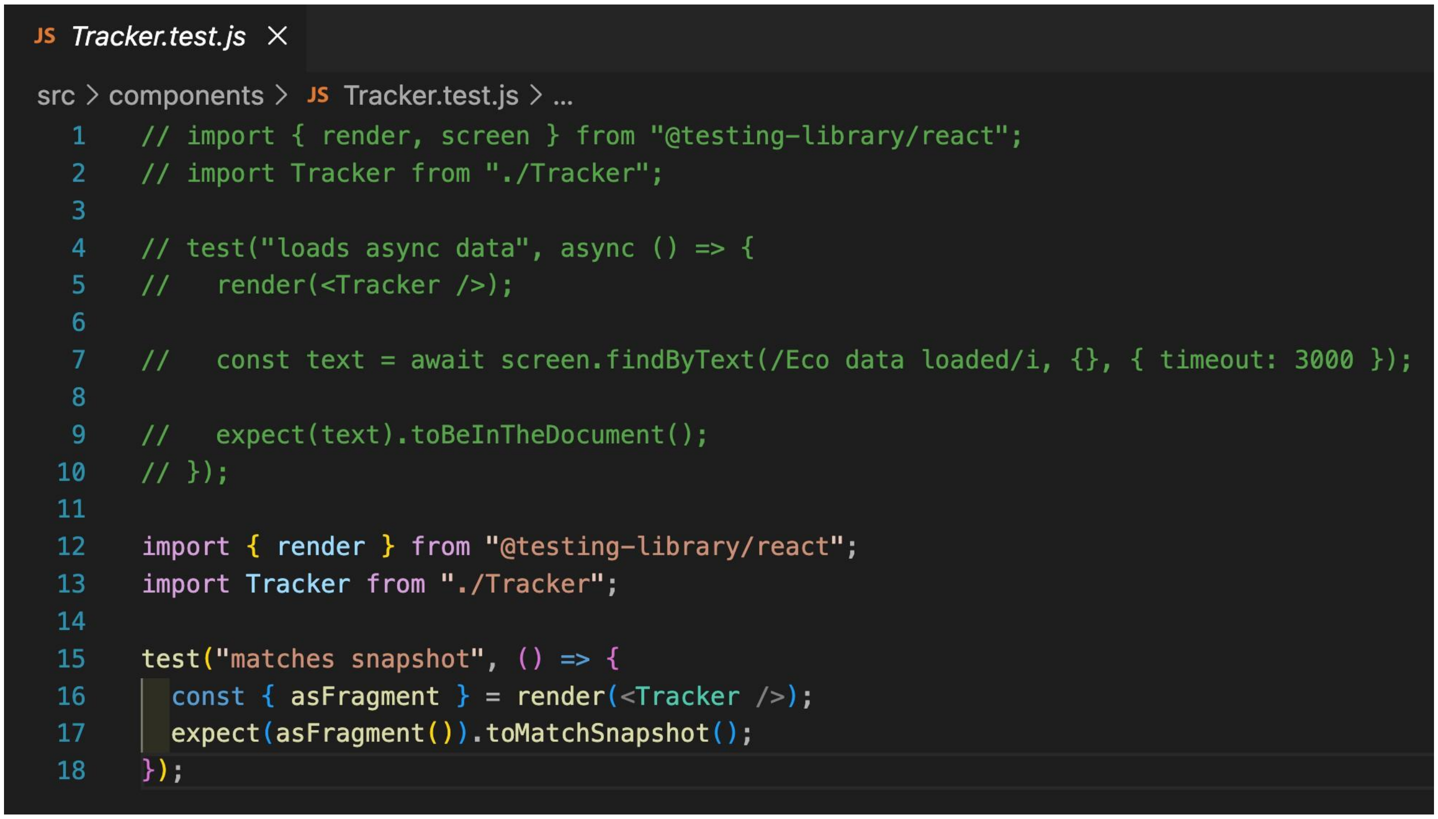
  • React.js
  • JavaScript (ES6)
  • Jest Testing Framework
  • React Testing Library
  • VS Code
  • Node.js & npm
  • Web Browser (Chrome DevTools)

- **Implementation Description:-**

  • The EcoTrack application is tested to ensure correctness of both logic and UI behavior.
  • Unit testing is performed on utility functions (e.g., calculator function) using Jest.
  • React Testing Library is used to render components and verify UI structure.
  • Snapshot testing is applied to detect unintended UI changes over time.

• Automated tests improve application reliability and maintainability.
• Debugging tools such as browser DevTools and breakpoints help identify errors in logic or rendering.

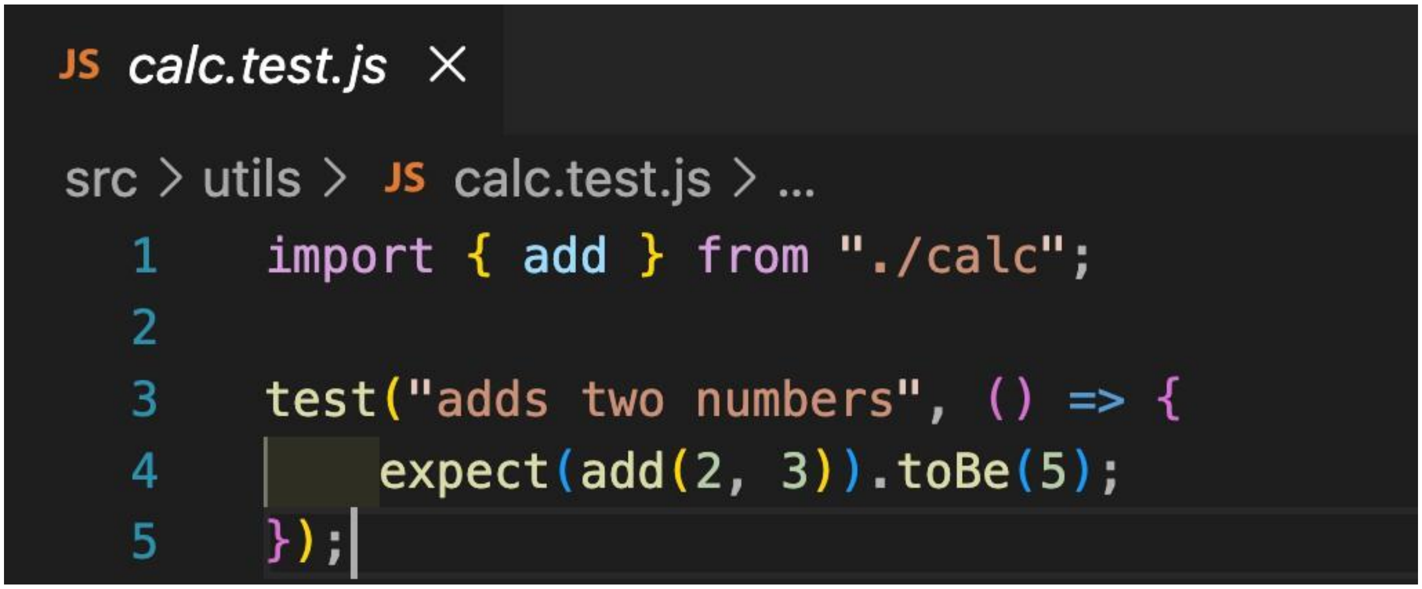
- **Sample Code Snippet:-**



Tracker.test.js

src > components > Tracker.test.js > ...

```
// import { render, screen } from "@testing-library/react";
// import Tracker from "./Tracker";

// test("loads async data", async () => {
//   render(<Tracker />);

//   const text = await screen.findByText(/Eco data loaded/i, {}, { timeout: 3000 });

//   expect(text).toBeInTheDocument();
// });

import { render } from "@testing-library/react";
import Tracker from "./Tracker";

test("matches snapshot", () => {
  const { asFragment } = render(<Tracker />);
  expect(asFragment()).toMatchSnapshot();
});
```



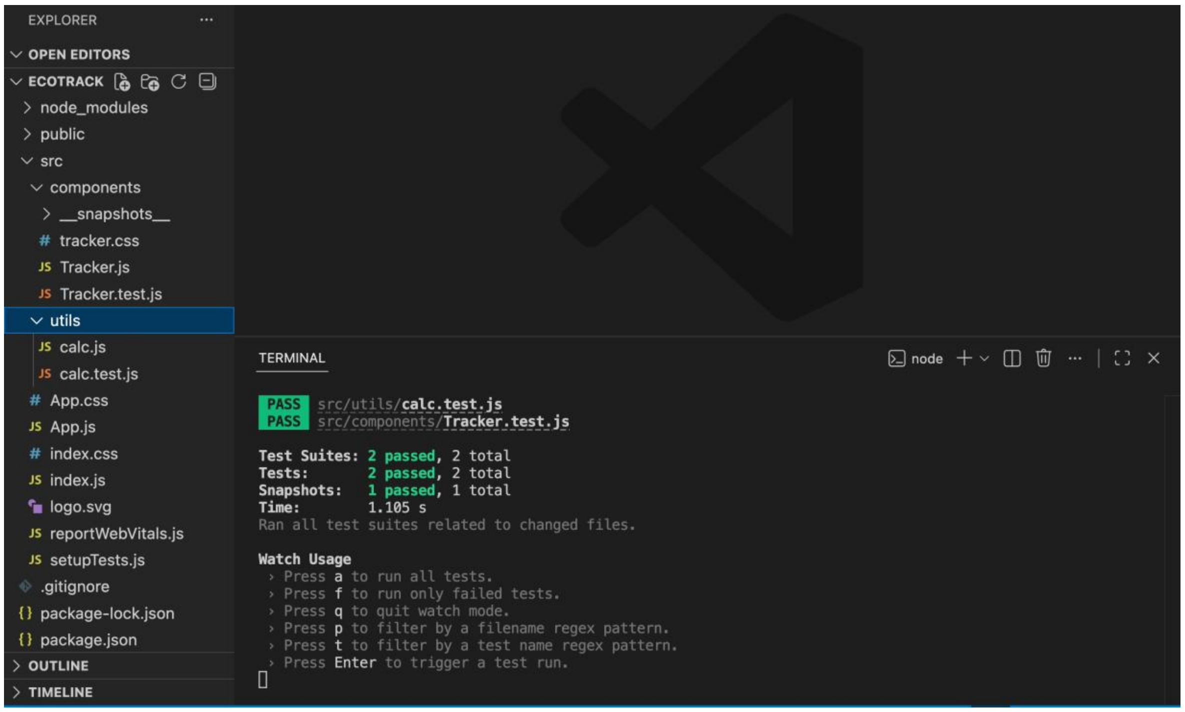
calc.test.js

src > utils > calc.test.js > ...

```
import { add } from "./calc";

test("adds two numbers", () => {
    expect(add(2, 3)).toBe(5);
});
```

4. Output:

• All Jest test cases executed successfully
• Utility function test passed
• React component snapshot test passed
• No unintended UI changes detected
• EcoTrack component rendered correctly during testing
• Debugging tools confirmed correct state updates and DOM rendering



```
 PASS  src/utils/calc.test.js
 PASS  src/components/Tracker.test.js

Test Suites: 2 passed, 2 total
Tests:       2 passed, 2 total
Snapshots:   1 passed, 1 total
Time:        1.105 s
Ran all test suites related to changed files.

Watch Usage
 › Press a to run all tests.
 › Press f to run only failed tests.
 › Press q to quit watch mode.
 › Press p to filter by a filename regex pattern.
 › Press t to filter by a test name regex pattern.
 › Press Enter to trigger a test run.
```

5. **Learning Outcomes (What I Have Learnt):**

- Importance of automated testing in frontend applications
- Writing unit tests using Jest framework
- Using matchers like toBe() and toMatchSnapshot()
- Testing React components with React Testing Library
- Validating UI rendering through DOM queries
- Understanding snapshot testing for UI stability
- Debugging React applications using DevTools and breakpoints
- Improving software reliability and maintainability through testing