**11. Routing in React (React Router)**

**Question 1: What is React Router? How does it handle routing in single-page applications?**

React Router is a **declarative routing** library used to handle dynamic routing in React apps. It allows you to:

* Define routes for different components (pages).
* Navigate between these routes using links or programmatically.
* Maintain the app’s state and UI without reloading the page.

**🔁 How React Router Handles Routing in SPAs:**

In a **single-page application**, the entire website runs on a single HTML file (usually index.html). Here's how React Router makes routing work:

1. **Browser History API**  
   It uses the **HTML5 History API** (pushState, replaceState, etc.) to manipulate the browser URL without refreshing the page.
2. **Routing Components**
   * <BrowserRouter>: Wraps the entire app and keeps the UI in sync with the URL.
   * <Routes>: A container for all the defined routes.
   * <Route>: Defines the actual route path and which component to render.
   * <Link> or <NavLink>: Used instead of <a> tags for internal navigation to avoid page reloads.
3. **URL Matching** When the URL changes (e.g., from /home to /about), React Router:
   * Checks the path defined in <Route path="/about" />
   * Matches it and renders the associated component (e.g., <About />) without refreshing the browser.

**🧠 Example:**

jsx

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import { BrowserRouter, Routes, Route, Link } from 'react-router-dom';

function App() {

return (

<BrowserRouter>

<nav>

<Link to="/">Home</Link> |

<Link to="/about">About</Link>

</nav>

<Routes>

<Route path="/" element={<Home />} />

<Route path="/about" element={<About />} />

</Routes>

</BrowserRouter>

);

}

function Home() {

return <h1>Welcome to Home</h1>;

}

function About() {

return <h1>About Us</h1>;

}

In this SPA:

* Clicking links changes the URL.
* React Router matches the path.
* The correct component is rendered — **without reloading the page**.

 Question 2: Explain the difference between BrowserRouter, Route, Link, and Switch components in React Router.

**1. BrowserRouter**

* It is the **router implementation** that uses the **HTML5 History API** to keep the UI in sync with the URL.
* It is used to wrap the entire application (or at least the part that uses routing).

**Example:**

jsx

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import { BrowserRouter } from 'react-router-dom';

<BrowserRouter>

{/\* Other components go here \*/}

</BrowserRouter>

**2. Route**

* The Route component is used to **define the path** and the **component that should render** when the URL matches that path.

**Example:**

jsx

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import { Route } from 'react-router-dom';

<Route path="/about" element={<About />} />

**3. Link**

* The Link component is used for **navigation** between routes without reloading the page (like an anchor <a> tag but handled internally by React Router).

**Example:**

jsx

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import { Link } from 'react-router-dom';

<Link to="/about">Go to About</Link>

**4. Switch (React Router v5)**

* The Switch component is used to **render the first Route that matches the URL**.
* It ensures **only one route** is rendered at a time.

**Note:** In **React Router v6**, Switch has been replaced by Routes.

**Example in v5:**

jsx

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import { Switch, Route } from 'react-router-dom';

<Switch>

<Route path="/about" component={About} />

<Route path="/contact" component={Contact} />

</Switch>