**1. ReactJS-HOL**

**• Define SPA and its benefits**

SPA (Single-Page Application) is a type of web application that loads a single HTML page and dynamically updates content without reloading the whole page. It uses JavaScript frameworks like React, Angular, or Vue to handle routing and rendering.

Benefits of SPA:

* Faster user experience as only data is updated, not the full page.
* Seamless navigation without full-page reloads.
* Efficient use of bandwidth.
* Improved performance due to reduced server load.
* Easier to turn into a mobile app using frameworks like React Native.

**• Define React and identify its working**

React is an open-source JavaScript library developed by Facebook for building user interfaces, especially for single-page applications. It allows developers to create large web applications that can update and render efficiently in response to data changes.

How React Works:

* React uses components to break the UI into reusable pieces.
* It utilizes a Virtual DOM to detect changes in the UI.
* When a change is detected, React only updates the necessary parts of the DOM (not the whole page), improving performance.

**• Identify the differences between SPA and MPA**

| **Feature** | **SPA (Single-Page Application)** | **MPA (Multi-Page Application)** |
| --- | --- | --- |
| Page Loading | Loads one page and updates content dynamically | Loads a new HTML page for each request |
| Speed | Faster due to less server interaction | Slower due to full-page reloads |
| Routing | Handled on the client side (JavaScript) | Handled on the server side |
| Development | Better suited for dynamic platforms | Better for static content or SEO-heavy apps |
| Examples | Gmail, Facebook, Twitter | Amazon, LinkedIn (earlier), Wikipedia |

**• Explain Pros & Cons of Single-Page Application**

**Pros:**

* Fast and responsive UI.
* Smooth transitions and navigation.
* Better caching.
* Reusable components (with frameworks like React).

**Cons:**

* Poor SEO (unless using SSR).
* Initial load time can be high.
* Browser history & analytics are harder to manage.
* Requires JavaScript to be enabled in the browser.

**• Explain about React**

React is a component-based JavaScript library used to build fast and interactive user interfaces. It follows a declarative approach, making code more predictable and easier to debug. React promotes reusability through components and provides efficient rendering using the Virtual DOM.

React can be used for:

* Building single-page web apps.
* Creating reusable UI components.
* Developing mobile apps with React Native.

**• Define virtual DOM**

The Virtual DOM (VDOM) is a lightweight copy of the real DOM maintained in memory by React. Whenever changes occur, React compares the virtual DOM with the real DOM using a process called "diffing" and updates only the changed parts, leading to faster performance.

Key Points:

* Improves speed and efficiency.
* Minimizes direct manipulation of the actual DOM.
* Helps in smooth UI updates.

**• Explain Features of React**

1. JSX (JavaScript XML): Allows writing HTML inside JavaScript, making code easier to understand.
2. Component-Based Architecture: UI is broken into small, reusable components.
3. Virtual DOM: Efficient updating and rendering of UI.
4. Unidirectional Data Flow: Data flows from parent to child, making app structure more predictable.
5. Declarative UI: Developers describe what the UI should look like, and React handles the rendering.
6. React Hooks: Allows the use of state and other React features in functional components.
7. React Native: Enables building mobile apps using the same principles and components.