**1. ReactJS-HOL**

1. Define SPA (Single Page Application) and Its Benefits

A Single Page Application (SPA) is a web app that loads a single HTML page and dynamically updates the content as the user interacts — without reloading the entire page.

Benefits:

* Faster navigation (no full-page reloads)
* Better performance after initial load
* Feels like a mobile app
* Data fetched asynchronously using APIs (AJAX or fetch)
* Better user experience with smooth transitions

2. Define React and Identify Its Working

React is a JavaScript library developed by Facebook for building user interfaces, especially for SPAs.

Working:

* Uses a component-based architecture.
* Maintains a virtual DOM to detect changes efficiently.
* When the state changes, React re-renders only the changed components (not the full page).
* Promotes declarative UI and unidirectional data flow.

3. Differences Between SPA and MPA

| **Feature** | **SPA (Single Page App)** | **MPA (Multi Page App)** |
| --- | --- | --- |
| Page Reloads | No (dynamic routing) | Yes (full reload on each nav) |
| Speed | Fast after initial load | Slower due to full reloads |
| Server Requests | Few (uses API for data only) | Many (loads each page via server) |
| Example Frameworks | React, Angular, Vue | PHP, ASP.NET, JSP, Django |
| Browser History | Managed via JS (e.g., React Router) | Managed by server |

4. Pros and Cons of SPA

Pros:

* Faster user experience
* Easy to build with frontend frameworks (React, Vue)
* Reusable components
* Mobile-app-like feel
* Efficient API usage

Cons:

* Slower initial load
* SEO is harder (though fixable with SSR)
* Browser history and analytics need manual handling
* Requires JavaScript to work

5. Explain About React

React is:

* A JavaScript library for building user interfaces.
* Maintains a virtual DOM for efficient rendering.
* Uses components for modular development.
* Ideal for building Single Page Applications (SPAs).
* Supported by a large ecosystem: React Router, Redux, etc.

6. Define Virtual DOM

Virtual DOM:

A lightweight copy of the real DOM maintained in memory by React.

Working:

* When a component changes, React updates the virtual DOM first.
* It then compares (diffs) the virtual DOM with the old version.
* Only the changed parts are updated in the real DOM — increasing performance.

7. Features of React

| Feature | Description |
| --- | --- |
| JSX | JavaScript + XML syntax for writing UI |
| Components | Reusable, isolated pieces of UI |
| Virtual DOM | Improves rendering speed by minimizing DOM updates |
| Unidirectional Data Flow | Data flows from parent to child only |
| Hooks | Manage state and side effects in functional components |
| React Router | Handles client-side routing |
| Rich Ecosystem | Integrates with Redux, Axios, etc. |