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Assignment 2

1. Define Progressive Web App (PWA) and explain its significance in modern web development. Discuss the key characteristics that differentiate PWAs from traditional mobile apps

→ A Progressive Web App (PWA) is a type of web application that utilizes modern web capabilities to add provide users with an experience similar to that of native mobile applications. PWAs are designed to be fast, reliable, and engaging, and they can work seamlessly across various devices and platforms. One of the key features of PWAs is their ability to be installed on a user's device like a native app, allowing for offline access and push notifications. PWAs are built using standard web technologies such as HTML, CSS and JavaScript but incorporate additional features like service workers

Significance in Modern Web Development

- Enhanced User Experience: PWAs offer a more seamless and engaging user experience compared to traditional websites.

- Cross-platform Compatibility: PWAs can run on any device with a compatible browser, eliminating the need for separate development efforts for different platforms.

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- Offline Functionality : With the help of Service Workers, PWAs can function offline or in low connectivity environments.

- Improved Performance : PWAs are optimized for performance, resulting in faster loading times and smoother interactions.

Key characteristics differentiating PWAs from Traditional Mobile Apps :

- PWAs are built using web technologies (HTML, CSS, JavaScript) and run in a web browser whereas traditional mobile apps are typically developed using platform-specific languages and distributed through app stores.

- PWAs do not require installation from an app store ; users can add them to their Home screen directly from browser.

- PWAs are responsive and can adapt to various screen sizes and orientations, similar to modern websites, whereas traditional mobile apps may require separate versions for different screen sizes or orientation.

2. Define responsive web design and explain its importance in the context of Progressive Web apps. Compare and contrast responsive,

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fluid, and adaptive web design approaches.

→ Responsive web design is an approach to designing and coding websites that ensures they adapt and respond to different devices and screen sizes. A responsive website dynamically adjust its layout, content and features to provide an optimal viewing experience across a wide range of devices.

- Importance in the context of Progressive web Apps:
Responsive web design is crucial for PWAs because it ensures that the app's interface and content are properly displayed and accessible across various devices and screen sizes, regardless of whether the user is accessing the PWA

	Responsive	Fluid	Adaptive
(i)	Layout is grid with breakpoints	Proportional resizing	Predefined layouts.
(ii)	Breakpoints is CSS media queries	N/A	Predefined points
(iii)	Flexibility is high	Moderate	Moderate
(iv)	Development effort is moderate	low	high
(v)	Performance is optimized	Good	variable

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3. Design the lifecycle of Service Workers, including registration, installation and activation phase

- Service Workers are a key component of PWAs responsible for enabling features like offline functionality, background sync and push notifications. The lifecycle of a Service Worker involves three main phases.

(i) Registration: During the registration phase, a Service Worker script is registered with the browser by the web application. This typically occurs in the main JavaScript file of the web app and involves calling the 'navigator.serviceWorker.register()' method, specifying the path to the Service Worker script.

(ii) Installation: Once registered, the Service Worker script is downloaded and installed by the browser. During installation, the Service Worker can cache static assets and other resources required for offline functionality using 'Cache' API.

(iii) Activation: After installation, the Service Worker enters the activation phase, during which it becomes active and can control pages or resources specified by its scope. The activation phase occurs when there are no active instances of the old Service Worker (if any), allowing the new Service Worker to take control.

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4. Explain the use of Indexed DB in the Service Worker for data storage.

→ Indexed DB is a low-level API for storing large amount of structured data (such as JSON objects) in the browser, allowing web applications to store data locally for offline use or improved performance.

- Usage in Service Worker.

- Asynchronous API: Indexed DB operations are asynchronous allowing service workers to perform data storage and retrieval tasks without blocking the main thread.

- Large storage capacity: Indexed DB provides a significant amount of storage space compared to other browser storage options like Web Storage (local storage and session storage)

- Indexed Queries: Indexed DB supports indexed queries, enabling efficient retrieval of data based on specified indexes. which can enhance performance when dealing with large datasets

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