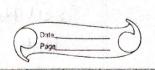Amit. B. Nayak
Roll NO :- 46.
D15B

Assignment - 2.

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

→ A progressive web app is a type of web application that utilizes modern web application to deliver an app-like experience to users PWA's are designed to be responsive, fast, & engaging & provide a seamless user experience across devices.

* Significance in Modern Web Development :

1. **Cross Platform Compatibility :-** PWA's can run on any device with a web browser, regardless of the operating system.

2. **Offline Functionality :-** One of the key features of PWAs is their ability to work offline or with limited connectivity.

3. **Free Installation :-** Unlike traditional apps PWA don't require installation from an app store users can simply access the PWA through web browser & add it to home screen.

* Key characteristics differentiating PWAs from Traditional Mobile Apps.

1. **Development Approach :-** PWAs are typically built using web technologies like HTML, CSS and JS while traditional apps are built using platform specific languages (e.g. swift, Kotlin).
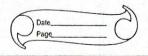
2. Distribution:- PWA's distributed via the web & can be easily shared via URL, whereas traditional apps are distributed through app stores and require approval from the respective platform's store.

3. Installation:- PWA's are accessed through web browser and can be added to the home screen while traditional apps are downloaded and installed from app stores.
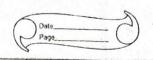
Overall, PWAs offer a compelling alternative to traditional mobile apps, providing a modern, cost-effective and accessible solution for delivering app-like experience on the web.
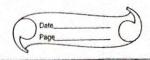
Q.2. Define responsive Web design and explain it's importance in the context of Progressive Web Apps. Compare and contrast responsive, fluid & adaptive web design

→ Responsive Web Design is an approach to web design that aims to create web pages that automatically adjust and adapt their layout and content to fit various screen sizes and devices, ensuring a consistent user experience across desktops, tablets & smartphones

Importance in the context of Progressive Web Apps:-

1. Accessibility:- Responsive design makes PWAs accessible to a wider audience, as users can access the app from any device without encountering, as users can access the app from any device without encountering layout issue.

2. Consistency:- By maintaining consistent design & layout across devices, responsive web design helps reinforce the branding & user experience.

3. Cross Device compatibility:- Since PWAs aim to provide a seamless user experience across different devices responsive web design pays a crucial role in ensuring that the PWA looks & functionalites as well.
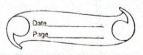
Responsive web Design	Fluid web Design	Adaptive web Design.
Uses flexible grids & layouts that adjust based on screen size.	Utilizes fluid grids & layouts that smoothly expand or contract.	Creates a multiple versions of the size optimized for specific devices.
Relies on CSS media queries to adapt styling based on screen size.	May use media queries but emphasizes fluidity of elements.	Uses server side detection to serve different layouts and versions.
One codebase that adapts to various devices	Emphasizes percentage based layouts & fluid images	Requires seperate versions of the site for different devices.
Offers consistent user experience across devices	Provides continuous user experience.	Tailors the user experience for specific devices.
Easier maintenance with single codebase	Requires adjustmant to ensure fluidity across devices.	Allows for precise control over user experience.

Q.5: Describe the lifecycle of service workers, including registrations, installation & activation phases.

→ The lifecycle of service workers involves several phases below is a detailed explanation of each phase :

1. Registration:
- The first step using a service worker is or register it within the web application
- Typically, done by including a registration script in the main JS file of the application.
- The process is initiated using 'navigate service worker register '( )' method.

2. Installation :
- Once service worker is registered, the browser begins the installation process.
- During installation the browser downloads the service worker file specified during registration.
- On successfull installation the service worker moves on the activation page.

3. Activation:
- After service worker is successfully installed, it goes through the activation phase.
- During activation, the new version of the service worker become active & takes a control of certain events and n/w requests within the scope of registration

Q.4. Explain the use of index DB in the service worker for data storage.

→ Indexed DB is a lower-level API for client-side storage of significant amounts of structured data, including files and blobs. It is useful for web applications that need to store large amount of data locally such as PWA's.

Here's how Indexed DB can be used in a service worker for data storage:

1. Caching Assets:- One of the primary use cases of indexed DB in a service worker is caching assets such as HTML, CSS, JS files, images & other resources. This allows application to function offline.

2. Dynamic Data Storage:- Indexed DB can also be used to store dyanamic data generated by the web application.

3. Background Synchronization:- Service workers can periodically sync data with a server in the background even when the application is not been used.

4. Performance Optimization: By storing frequently accessed data in indexed DB service workers can improve performance of applications.