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Assignment 2 - MPL

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

A] A progressive Web App (PWA) is a web application that delivers a native app-like experience using modern web technologies. It works across devices, supports offline access, and can be installed without an app store.

Significance in Modern Web Development.

- Cross-Platform : Runs on any device with a web browser.
- Online Support : Uses Service Workers for caching.
- Fast Performance : Loads quickly, even on slow networks.
- Engagement : Supports push notifications and installation.
- Lower Costs : A single codebase reduces development effort.

Feature	PWA	Traditional Mobile App.
Installation.	Via browser	App store
Offline Support	Via caching	Via explicit design.
Push Notification	Yes	Yes.
Platform dependency	Works on all browsers.	Platform specific.
Updates	Automatic	Requires user updates

2] Define responsive web design and explain its importance in the context of PWA. Compare and contrast responsive, fluid and adaptive web design approaches.

Responsive Web Design ensures a website adapts dynamically to different screen sizes using flexible layouts and media queries.

Importance in PWAs:

- Consistent User Experience : Optimizes for all screen sizes.
- Better Accessibility : Enhances usability across devices.
- Single Codebase : Reduces development effort.
- SEO Benefits : Google favors mobile friendly design.

Comparison of Web Design Approaches.

Feature	Responsive	Fluid	Adaptive
Definition	Adjusts layout dynamically	Uses percentage based widths	Uses fixed breakpoints
Flexibility	High	High	Limited.
Development Effort	Moderate	Low	High
Best Use Case	PWAs, modern sites	Simple layouts	Specific device layout.

3] Describe the lifecycle of Service Workers, including registration, installation, and activation phases

A Service Worker is a background script that enhances PWAS by enabling offline caching, push notifications and background sync.

Lifecycle Phases

1] Registration:
- Registered via navigator.service Worker.register ().
- Browser downloads and installs the scripts.

2.] Installation
- Triggers the install event
- Caches static assets for offline use

3] Activation
- Triggers the activate event
- Cleans up old caches and takes control of open pages.

4] Idle & Fetch Handling:
- Intercepts network requests and serves cached data.

5] Update & Termination.

- Detects new versions and replaces old workers.
- The browser terminates inactive service worker to save resources.

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

IndexedDB is a browser based NoSQL database for storing structured data persistently.

Benefits in service workers.

- Offline Storage : Saves data when the user is offline
- Efficient Data Syncing : Updates local data when online.
- Non Blocking Operations : Uses asynchronous API to prevent delays.

Ex:-

```
let db;
const req = indexedDB.open ("BKIA", 1);

req.onupgradeneeded = function (event) {
   let db = event.target.result;
   db.createObjectStore ("articles", {keyPath : "id"});
},

function storeArticle (article) {
   let transaction = db.transaction ("articles",
                              "readwrite");

   let store = transaction.objectStore ("articles");
   store.put (article),
}
```