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MPL Assignment - 02

e Progressive web app (PWA) and explain its significance
Modern web development. Discuss the key characteristics that
entiate PWAs from traditional mobile apps.

progressive web Apps (PWA) is a type of web application
work like a mobile app but runs in a browser.
can be installed on a device, work offline and provide
fast and smooth user experience.

nificane of PWA in Modern web development :
1] cross platform compatibility - works on both mobile and
ktop with a single codebase
] offline support - can support without the internet using
cached data
Fast Performance - loads quickly, even on slow networks
No app store required - users can installed visit directly
from the browser
lower development cost - one PWA can replace separate android
and ios apps.

y difference between PWA and Traditional Mobile App :

Features	PWA	Traditional Mobile App
stallation	Direct from browser	Download from App store.
ernet Required	work offline with caching	usually requires internet

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Performance	Fast with service workers	Fasters but need instal
updates	Automatic, no app store approval	Manual updates needed
Development cost	lower (one) codebase for all)	Higher (separate app f each platform

PWA's combine the best of web and mobile app, making the efficiency and user friendly.

Q2] Define responsive web - design and web design and Explain importance in the context of progessive web Apps compare and contrast, responsite, fluid and adaptive web desig approaches.

→ Responsive web Design is a technique that makes web pages a automically to different screen size and devices. It ensure a good user ~~expensive~~ experience on mobile tablet and desktops without needs separate version of a website.

Importance of responsive Design in PWA's
1] Better user Experience : PWA's work smoothly on any
2] Faster load time : optimized design improves speed.
3] SEO benefits : google ranks responsive sites higher
4] cost effecient : No need to build multiple version fo different screens.

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comparisM of web design Approaches :

Approach	How it works	Pros	cons.
Responsive	uses flexible grids and css Media queries to adjust layout	works on all devices improves SEO	can be complex to design
Fluid	uses percent-based widths instead of fixed pixels, so elements resizes smoothly	works well on different screen sizes easy to implement	less control over layout on large screens
Adaptive	uses fixed layouts that changes at specific breakpoints	optimized for known screen sizes	More efficient to design for each screen size.

Key difference :
- Responsive adapts dynamically to all screens
- Fluid resizes smootly but May not be fully optimized
- Adaptive loads different layout based on device type.

Responsive design is best for PWA because it ensures a seamless experience on all devices.

Describe the lifecycle of service workers including registration installation and activation four phase.

lifecycle of service workers :

A service workers is a script that runs in the backgrounds and helps a web app work offline, load faster and send

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3] Activation Phase: The old service workers replace with the new one
• unused cache files from the previous version are detected.

code Example:
```
self.addEventListener('activate', event => {
  event.waitUntil(
    caches.keys().then(keys => {
      return Promise.all(keys.map(key => {
        if (key!=='app.cache') {
          return caches.delete(key);
        }
      }));
    })
  );
});
```

Final step: Fetch & Sync
Once activated, the service worker intercepts network requests serves cached files and syncs data when the internet is avaliable This lifecycle Makes PWA's faster, More reliable and capable for working for offline.

Explain the use of indexed DB in the service worker for data storage.

IndexedDB is a browser database that stores large amounts of Structured data like JSON objects. It helps PWAs work offline by saving and retrving data efficiency.

push notification . Its lifecycle has three Main phases.

1] Registration phase:
The register the service worker using JavaScript

code Example:
```
if ('service worker' is navigator) {
navigator.serviceworker.register('/sw.js')
.then(() => console.log('service worker Registered'))
.catch(error => console.log('Registration failed:', Erro
}.
```
• This tells the browser to install and activite the se
workers.

2] Installation phase:
• The serve worker downloads necessary files (HTML, c
and stores then in cache.
if successful it Moves to the activation phase

code Example
```
self.addEventListener('install', event => {
    event.waitUnit(
    caches.open('app-cache').then(cache => {
    return cache.addAll(['/', '/index.html', '/style.css']);
    })
    );
});
```
• This ensures the app loads even without the internet

Why use IndexedDB in Service workers?
1] offline support - stores data when offline and syncs it later.
2] Efficient storage - saves structured data like user settings, Items, or form inputs
3] Faster Access - Retrieves data quickly without needed a network request
4] Persistent Data - Data remains saved even after the browser is

• Opening the database:

```
let db ;
let request = indexedDB.open ('MyDatabase', 1);
request.onsuccess = Function (event) {
    db = event.target.result ;
  };
```

• creating a store and adding Data

```
request.onupgradeneeded = Function (event) {
let db = event.target.result ;
let store = db.createObject Store ('users', {keyPath: 'id'});
Store.add ({id: 1, name : 'John Doe', age : 25});
};
```

• Fetching data in Service worker

```
let transaction = db.transaction ('users', 'readonly');
let store = transaction.object. stores. ('users') ;
let getuser = store.get (1);
get user.onsuccess = function () {
console.log (getuser.result);
};
```