Assignment No 2.

Define Progressive web Apps (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 uses modern web technologies to deliver a fast, reliable and engaging experience similar to native mobile apps. PWAs work across all devices and platforms while leveraging the benefits of both web and mobile application.

Significance of PWA in Modern Web Development.

- Cross Platform Compatability - Runs on all devices with a single code base.
- App-like Experience - Smooth animations, push notifications, and offline access.
- Improved Performance - Faster loading using caching and service workers.
- SEO Friendly - Indexed by search engines increasing discoverability.
- Automatic Updates - Always up-to date without manual downloads.
- No App Store Dependency - Direct installation from the browser.

Key Characteristics vs Traditional mobile A

Feature	PWA	Traditional app Downloaded from app store
① Installation	Enstaud via browser	Downloaded from app store.
② Platform	Works on all platforms	Separate apps for iOS & Android
③ Offline Access	Works offline using caching	Needs local storage.
④ Performance	Fast & light weight	can be heavy
⑤ Updates	Automatic	Manual update required.
⑥ Development cost	Lower	Higher.

PWA's are gaining popularity because they com
the best of web and mobile apps, making the
a cost-effective, high performance solution
for businesses and developers.

Q2. Define responsive web design and explain it
importance in the context of Progressive we
Apps. compare and contrast responsive fluid
adaptive web design approaches.

→ Responsive web Design (RWD) is an approach
ensures websites adapt to different screen siz
and devices by using flexible grids, layouts,
css media queries.

Teacher's Sign.: _____

Importance in PWAs:

Ensures a consistent user experience across
desktop, tablets and mobile devices.
Enhances performance and accessibility for a
wider audience.
Works with Progressive Enhancement making PWA,
more effective.
Helps PWAs feel more app-like by adjusting UI
dynamically.

Comparison of Responsive, Fluid, and Adaptive web Design

Feature	Responsive	Fluid	Adaptive
Definition	Uses CSS media queries to adjust layout dynamically	Uses percentage based units for flexible layout	Uses predefined layouts for specific screen sizes.
Flexibility	Highly flexible	Very flexible	Less flexible.
Breakpoint.	Uses breakpoint but adjusts smoothly	No fixed breakpoints	Uses fixed breakpoints
Example	Modern Websites & PWAs	Simple web pages.	Separate mobile & desktop designs.

Q3 Describe the Lifecycle of Service worker, including registration, installation and activation proem.

→ A service worker is a background script that enables offline support, caching and push notif in PWAs. It follows this lifecycle.

(1) Registration - The browser registers the service worker using Javascript (navigator. service Wor register)).

(2) Installation - The service worker downloads an caches necessary files (install event).

(3) Activation - Old caches are cleaned, and the worker starts controlling pages (activate

(4) Fetching & syncing: Handles network requ push notifications and background sync.

Q4. Explain the use of Index DB in t Service worker for data storage.

→ Index DB is a low-level, NoSQL databas used for storing large amounts of struc data in browser.

Why use IndexDB in Service workers

- Stores persistent, offline-accession data user preferences, app data).

works asynchronously preventing UI blocking

* Allows structured storage using key-value pairs.

Eg: Storing Data in Indexed DB via Service Worker.

```
const dbRequest = indexed DB. open ('PWA-
dbRequest.onsuccess = function (event) {
    const db = event.target.result;
    const transaction = db.transaction ('user
    const store =
    const store = transaction. objectstore ('user'
    store.put ({ id: 1, name: 'Urvashi' });
};
```

This helps PWAs work efficiently offline, enhancing performance and user experience