

Explain the key features and advantages of using flutter for mobile app development

Advantages: and Features:

- i) Single Database: write once and run on both android and iOS
- ii) Fast development: Instantly see changes
- iii) UI with customization: Uses its own rendering agent to create highly customizable UI
- iv) Performance: Flutter compiles to native code, ensuring smooth animations
- v) Widget library: pre-designed material and Cupertino widget for android & iOS

How flutter differs from traditional approaches and its popularity

Traditional mobile development requires separate device for android and iOS, which increases complexity

Flutter differs by:

Using widgets instead of native UI components. Everything in flutter is a widget making UI development consistent across platform

Define PWA and explain its significance in modern web development. Discuss the key characteristics that differentiate PWAs from traditional mobile apps. A PWA is a web application that utilizes modern web capabilities like service workers, manifest and responsive design to deliver an experience similar to native mobile apps. PWAs are fast, reliable and engaging, functioning well even in uncertain conditions.

Significance of PWA

- Crossplatform development
- Offline support
- Installation without App store
- Push Notifications
- Improved Performance
- SEO Friendly

Key characteristics

Feature	PWA	Traditional mobile app
Installation	Directly from browser	Through app stores
Update	Seamless Automatic Update	Manual update or automatic via store
Platform	Web-based	Platform-specific
Performance	Fast via caching	Fast due to native code
Distribution	Web URL	App stores
User	Push notifications	Full device integration
Engagement		

2) Define Responsive web design and explain its importance. Compare responsive, fluid and adaptive design approaches

→ RWD is a design technique that ensures a website's layout adapts smoothly to different screen sizes and orientations.

Importance in PWAs:

- PWAs aim to work seamlessly across devices. Without responsive design, an app may be unusable or unattractive on smaller screens.
- Enhances user experience
- Contributes to SEO Ranking

Comparison

	Responsive	Fluid	Adaptive
1) Use media query to change layout	Use media query to change layout	Use percentage-based widths	Uses pre-defined fixed layouts
2) Highly flexible	Highly flexible	Very flexible	Limited flexibility
3) Generally optimized	Generally optimized	Fast loading	May load unnecessary layers
4) All devices with 1 layout	All devices with 1 layout	All devices, adjust size proportionally	Specific layout for specific devices

Describe the lifecycle of service workers including registration, installation and activation phases.

Service workers are javascript keywords for separating from the main browser thread and act as a network proxy. The lifecycle includes:

a) Registration

- Done in the main thread using javascript
- Only runs once there's a change in the service worker file

b) Installation

- Triggered once the browser detects a new or updated service worker file.
- Creates static assets for offline use

c) Activation

- Cleans up old caches and takes control of all clients
- Happens after installation and before fetch events are handled

d) Fetch

- Handles fetch request
- Can respond with cached content or fetch from network

4) Explain Use of Indexed DB

→ IndexedDB is a low-level, asynchronous API provided by modern browsers to store large volume of structured data. It allows key-value storage and supports transactions.

Why use IndexedDB:

- Works offline and can persist large amounts of data
- Allows storing API responses, form data, images or app state
- Enables advanced caching strategies like "state-while-revalidate"

Using it in service workers:

- Ideal for syncing data when the user comes online
- Can be combined with background sync and send saved requests to the server later