Name: Atif Ansani Roll no: 04 Class: D15B MPL Assignment -1 9-1)a Explain the key features and advantages of using flutter for mobile app development. Flutter is an open-source ut software development toolkit created by Google for building natively comple compiled applications for mobile, web, and desktop from a single codebase.

Key features of flutter: 2. Single Codebase: Developers can write one codebase for

both Android and ios, reducing development time. 2. Fast Performance: Uses the Dart programming language, which compiles to native ARM code for high performance.

3. Hot Reload: Instantly reflects changes in the UI without restarting the application,

enhancing developer productivity.

4. Rich UT components: Provides a vast collection of customizable widgets for creating beautiful UIs:

5. Support for Web and Desktop Apps: Extends beyond mobile to support web and destrop applications.

6. Access to Device Features: Allows easy integration with device-specific APIs such as camera, GPS, and sensors and landidition suited

Maintained by Google and has a strong developer community.

		19PL Assignment - 1	=	
	Advantage	es of Using Flutter:		
prois	· Cost ar	nd Time Efficiency: Reduces development to	me	
	and co	osts by allowing the same codebase to	8	
and of the	multiple	platforms		
14	· faster Development: The not reload feature			
. 5 %	significantly speeds up the development			
	process. Jak a most gatales and			
	· Open Source and Free: Completely free to			
	use, with extensive documentation and community			
red.		no Single Codebase: Bevelopers can work o		
300/4	· High	Performance: Since it compiles to nation	ve	
S. In in One 10	ARM	code, it performs better than bradition	onal	
1601- 3	Cross -	platform solutions like React Native	•	
	high perdonance			
ni k	DISCUSS	how Flutter tramework differs from		
Cup C	traditio	traditional approaches and why it has		
0.11-	gained	popularity in the developer common	ity	
9 1	Modelle	Flutter differs significantly from toaditional		
UT FLUDACE	how i	development approaches, primarily i	n	
nh.		supports cross-platform development.		
450	supposes cossipation development.			
	Differe	Differences Between Flutter and Traditional		
Harashni	Approaches:			
645,	saith device-specific APIs such as rames			
	Feature	Traditional Development Flutter	1	
Active	3 roggu 2	of Crowing Community and Assais	7	
' prod	Codebase	Separate codebases for Single codebase for		
		Android and ios. both Android and	25 10	
		i,OS:		
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	March adilas	me releges of bezu tion s	providing the
- NT	UI Rendering	Uses native UI components	Uses Skia rendering
15.	roff of a	of the respective platform	engine to draw
4	Minus blue	Destable herelapers non	UI independently
	and all ann 200	real-loss stidora J-201	Amouse!
1	Performance	Vative performance but	Near-native performance -
	(C) Symmetry	requires separate implementations	due to direct
1	ai and Jap	sice and to toposion and	compilation to .
c	has it	notingging Laptice work	machine code
		Tomplex Typer : 17-Lex-land	hlive!
űc.	Development	Slower due to separate fa	ster due to Hot
	Speed	dove formant for platforms / Re	load and shared
-	ofter analy	a an is add acragho	I code
1	Addigment to	si sort out in the tree is	4307
	Apps size	Smaller due to native Slig	htly larger due -
	cal born to	UI components. to be	sitt-in sendening
24		trabics the significency	ne
		diets (on Doction to D.	100 40 154

Reasons for flutters Popularity:

1. Cross-Platform Efficiency: Enables faster deveo
development with a single codebase for
multiple platforms.

Peland for Instant Updates: Allows 2. Hot Reload for Instant Updates: Allows developers to see Changes instantly, making debugging and UI design easies.

3. Modern VI Capabilities: Comes with a rich set
of widgets and animations, allowing developers
to create visually appealing applications.
4. Strong Google, Support & Growing Ecosystem: Backend
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by Google and used in popular apps like Google Ads,
Alibaba, and BMW. attracting more developers.

4. Expanding Beyond Mobile: With flutter web
and Desktop, developers can build applications
beyond just mobile platforms, making it
more Versatile. Q.2a) Describe the concept of the widget tree in flutter.

Explain how widget composition is used to

build complex user interfaces. -> In flutter, everything is a widget. A widget tree is the hierarchical structure of widgets that define the UI of a flutter application. Each widget in the tree is responsible for rendering a specific part of the UI. The tree starts from a root widget and branches into multiple child widgets. Hig Widgets Composition in Building Complex UIs:
Flutter follows a composition-based approach, meaning complex UIs are built by nesting smaller reusable widgets. Instead of extending a single UI class flutter encourages combining multiple widgets to create sophisticated designs for example a login screen may may consist of: · A Column Widget for Vertical alignment.

· Textfield widgets for User input. · A Button widget for submission.

· A Padding widget for spacing.

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	By composing simple widgets together, developers can build scalable and maintainable uzs.		
1.17	can build scalable and maintainable uzs.		
	alast Til at	1+ mont or while 9 h 2 to 60 to 0	
6)	Provide examples	of commonly used widgets and their ting a widget tree.	
	roles in crea	ting a widget tree.	
Horsen,	rongold the 12	to a state of the	
	Widget	Role in Widget Tree	
Deen use	ucial in flutte	of transportant offite	
(ب	MaterialApp	Root widget for a Material Design app.	
•	ofters ut is boi		
1	Scaffold	Provides app structure with App Bar, body,	
5	applications sta	and Floating Action Button	
		a total a total a	
	Container	A versatile widget for styling.	
	Timportantz	i languaganaganaganaganaganaganaganaganagan	
charaes.	Row / Column	Layout widgets for horizontal and	
21:301	as staron houses se	vertical alignment.	
	inacomi splinges	Japain wassandalling same sa.	
	Text	Displays text content.	
0	exons but saw	als signification logic etc.	
	Image	Displays images from assets.	
	10	network, or memory.	
1	States in thete	Scrollable list of widgets.	
	ListView	Po to A to	
sidgets.	July 2000	User input field.	
	Textfield	tensinos bas armas la	
	ElevatedButton	A Material-style button with elevation	
	Dievateabuctan	The throat of the second secon	
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3(40/1)	These widgets form a hierarchical structure, when
- 2 X()	parent widgets contain and manage child
	widgett . deligion have the UT looke and
Y for 0)	Derray es. A Maria Maria Maria de la companión
0.7.1	Discuss the importance of state management
9.310	Discuss the importance of state management
->	in flutter applications.  State management
Terion nage	it delaringement is crucial in flutter because
	State management is crucial in flutter because it determines how much uI components react to changes in data Since flutters up to little
the Body	changes in data Since flutter's UI is built
	Using widgets, the UI needs to be updated  dynamically whenever the cooling to
	dynamically whenever the application's state
	ONTH TO THE ANDRESS AND A STATE OF THE STATE
1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0(0)	· It ensures the UI remains responsive to changes.
	· Helps maintain data consistency across screens.
	Reduces unnecessary widget rebuilds improving
	performance.  Makes applied to the sebuilds improving
	· Makes application logic cleaner and more
	Transport of the second of the
•	Mere are than I
	1. Ephemeral State: Affect states in flutter:
	2. App-wide state: Shared across multiple widget.
b)	Moltiple widgets
nofferels	compare and contract diffi
112/10/42/3	management approaches in Flutter.
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-	Approach	Description	Best Use Cases
		a Fineborge Protect!	skere) is
	setState	Built-in method to update	Small UI updates within
- (be selup	and follow	local state within a	a single widget.
		Ctatefulwidget.	
		138 fo Flytter Ann:	lasi3 bhA s
	Provider	A dependency injection	Medium-sized apps where
	Attasp. 398	0	state needs to be
52	derif die	state sharing across	accessed by multiple
0		the widget tree	widgets.
	Riverpod	An improved version of	Large-scale apps
- 44 4	inhaniana ni	Provider with better	requiring better
		performance and	dependency
	r) basilallin	testability.	management and
	· () a	nit Pixebase initialize A	testability
		(DogAvin) ggA	
			F .

When to Use Each Approach:

· setState -> When managing UI state in a single

· Provider -> When managing state across multiple · Riverpod -> When the app has complex business logic

and requires better state handling.

Q.4) a) Explain the process of integrating Firebase with a flutter application. Discuss the benefits of using firebase as a backend solution.

->	Steps to Integrate Firebase with Flutter:
	1. Create a fixebaca Draiget:
194 H (C) 23	· 40 to: Fixehace Concola
1 44	· Click on "Create a Project" and follow the setup.
	†88 h W 1 2 4 4 2 9
I yester one	2. Add Firebase to Flutter App:
	Register the non line
sluil o	· Add firebase dependencies in pubspec.yaml.  · Run suffersive cools
	· Run flutterfire Configure to link firebase  to the project.
	to the project.
6000	3. Initialize Circhania
19143	3. Initialize fixebase in flutter:  Import and initialize fixebase in main.dart file:  void main () asyno f
	void main () acres ( main.dart file:
bna	harrist and haid and at the
	run App (myApp());
9/00	4. Use Firebase Services:
	· Implement Civil Die
n.lm	or cloud storage as needed
والم	in the same of the
21	Benefits of Using Finder
- enil	· Real-time Database & Firestore: Syncs data across devices in real-time.
	devices in solling
a Hi	· Scalability: Guard 1 4
paizu -	· Scalability: Supports both small and large-scale applications.  Authentication: Provides secure user authentication with Google, Facebook et
	with google, facebook, etc.
(Sundaram)	· Cloud functions: Runs server-side lonic with
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	backend infrastructure.			
	managing backend infrastructure.  Mosting & Storage: Offers hosting for web apps and cloud storage for media files.			
	b) Highlight the firebase services commonly used in Flutter development and provide a brief overview of how data synchronization is achieved.  Common firebase Services in flutter:			
6)				
pil				
1,150				
->	Common firebase	SERVICES THE CONTRACTOR OF THE		
2.5		Functionality		
0 2	Service			
	Firebase Authentication	Handles user asthentication		
1 No to 6	HOTEBOSE FIO CHEMICE	0111 2 127 1 1 1		
54((1)1)	Cloud Firestore	Nosge database for réal-time		
ra vinorio	Herachbons. Fivebose	data storage and sync.		
3000	I've waviding real-4	JSON-based database that updates		
bry	Realtime database	inte instantly.		
bond	ad Jutescard is	January Machalos		
	Cloud Storage	Stores and serves user-generated		
	C1000 2(01.7c	content like images and videos.		
		o de la colificación de la colif		
	Firebase Cloud Messaging	Sends push notifications		
	A THE PROPERTY OF THE PROPERTY	to users.		
	No. 1 Lice	Tracks user behavior in		
	Firebase Analytics	the app.		
	Cloud Functions	Executes backend logic in		
		response to events.		
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## Data Synchronization in fixebase: · Firestore & Realtime Database: sync data in real time across devices. · Offline Support: Data is cached locally when offline and syncs when reconnected. · Automatic Conflict Resolution: Ensures consistency by managing data conflicts of during synchronization. Conclusion: flutter's widget-based structure enables efficient ut design, while state management ensures smooth interactions. Firebase enhances app functionality by providing real-time ES 150 0 data sync, authentication, and backend Services, making it a powerful backend 36 lution for modern applications. - cases and some sample content like images and Mirchage Cloud Messaging sends push notifica