

National University of Computer and Emerging Sciences
Islamabad Campus

**Software for Mobile Devices
(CS4039)**

Course Instructor(s):

Mr. Saad Salman

Section(s): 5A, 5B, 7A, and 7B

Final Exam

Total Time (Hrs): 3

Total Marks: 200

Total Questions: 2

Date: Dec 26, 2025

Invigilator's Signature

Roll No

Course Section

Student Signature

Do not write below this line.

Attempt all the questions.

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. Attempt on question paper. Read the question carefully, understand the question, and then attempt it. In case you think there are multiple correct answer, choose the most suitable one.
2. Verify that you have **twenty six (26)** different printed pages including this title page. There are **two (02)** questions and **Q1 has total of 160 MCQs**.
3. Calculator sharing is strictly prohibited.
4. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.
5. Ensure that you do not have any electronic gadget (like mobile phone, smart watch, etc.) with you.
6. **Students are permitted to bring one handwritten cheat sheet of exact A4 size (both sides). Please ensure that the sheet strictly adheres to the specified dimensions neither smaller nor larger will be accepted as announced earlier in the GCR.**

Instruction for filling the OMR (MCQs answer sheet) sheet

1. The OMR sheet should not be folded or crushed, detached from the question paper and **you are not allowed to write anything on the back of OMR sheet**.
2. Use only blue/black ball pen. Don't use lead pencils. Any part done by lead pencil will not be marked and cannot be claimed for rechecking.
3. Circle should be darkened completely and properly.
4. **Use of correction pen on OMR sheet is prohibited, Use of correction pen on OMR sheet will result in negative marking of -1 per use.**

	Q1				Q2	Total
	CLO-1	CLO-2	CLO-3	CLO-4	CLO-4	
Total Marks	09	80	43	28	30	190
Obtained Marks						

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Question 1 [160 Marks]

[CLO-1 Describe the architecture, platforms, and core components of mobile operating systems and development frameworks.]

1. According to the Android architecture diagram, which layer is situated directly between the Java API Framework and the Hardware Abstraction Layer (HAL)?
 - A. System Apps
 - B. Linux Kernel
 - C. Content Providers
 - D. Native C/C++ Libraries and Android Runtime**
2. What is the primary role of the Linux Kernel in the Android operating system?
 - A. To run applications in optimized virtual machines with garbage collection.
 - B. To offer standard interfaces for hardware like the camera and Bluetooth modules.
 - C. To manage core system services like threading, low-level memory, and hardware drivers.**
 - D. To provide the Java APIs that developers use to build applications.
3. Which Android application component is designed to perform long-running operations in the background without a user interface?
 - A. Broadcast Receivers
 - B. Content Providers
 - C. Services**
 - D. Activities
4. What is the purpose of the Hardware Abstraction Layer (HAL)?
 - A. To provide a set of core apps like the Dialer, Email, and Camera.
 - B. To compile application code into native machine code for better performance.
 - C. To expose device hardware capabilities to the Java API framework through standard interfaces.**
 - D. To manage inter-process communication (IPC) between different applications.
5. Which of the following components is part of the Android Runtime layer?
 - A. WebKit
 - B. View System
 - C. Binder (IPC)
 - D. Android Runtime (ART) and Core Libraries**
6. According to the course outline, what is the consequence of plagiarism in an exam or project for CS-4039?
 - A. Zero marks in that specific exam or project.
 - B. An F grade in the course.**
 - C. A formal warning and a chance to resubmit.
 - D. A deduction of 50% of the total marks for the course.
7. What is the role of an 'Activity' in an Android application?
 - A. To supply data from one application to another upon request.
 - B. To run in the background to perform ongoing operations.
 - C. To respond to system-wide broadcast announcements.
 - D. To represent a single screen with a user interface.**
8. Many core Android components like ART and HAL are built from native code. How does the Android platform typically expose the functionality of these native libraries to apps?

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- A. Through the Hardware Abstraction Layer (HAL).
 - B. Apps must directly call the C/C++ libraries, bypassing other layers.
 - C. Through Java framework APIs.**
 - D. Via the Linux Kernel's system calls.
9. Which statement accurately describes the status of 'System Apps' like the calendar or email client on Android?
- A. They are the only applications that can access the Native C/C++ Libraries directly.
 - B. They have no special status among the apps the user chooses to install.**
 - C. They have special privileges and cannot be replaced by user-installed apps.
 - D. They are part of the Linux Kernel and are essential for the OS to boot.

[CLO-2 Apply Android components (Activities, Intents, Layouts, RecyclerView, SQLite, Firebase) to build functional apps.]

10. What is the primary function of the `AndroidManifest.xml` file in an Android application?
- A. To store centralized color and string resources for consistency and localization.
 - B. To manage project dependencies, plugins, and SDK versions for the build process.
 - C. To declare the app's components, such as activities and services, and to request necessary permissions.**
 - D. To define the user interface layout using XML elements.
11. In which file would a developer typically define the `minSdk` and `targetSdk` versions for an app module?
- A. strings.xml
 - B. AndroidManifest.xml
 - C. build.gradle (Module: app)**
 - D. settings.gradle.kts
12. What is the primary benefit of using `strings.xml` to manage text in an Android app?
- A. It improves the app's runtime performance significantly.
 - B. It automatically adjusts font sizes for different screen densities.
 - C. It is the only way the Android compiler can process text.
 - D. It centralizes text, which simplifies reusability and localization for different languages.**
13. What is the definition of an Android 'Activity'?
- A. A background process that performs long-running tasks without a user interface.
 - B. A single screen that provides a user interface for interaction.**
 - C. The script responsible for compiling code and managing project dependencies.
 - D. A file that stores and transports data, such as user preferences.
14. In a vertical `LinearLayout`, how would you configure three child views to each occupy an equal amount of screen space?
- A. Set `layout_height="match_parent"` and `layout_weight="1"` for each view.
 - B. Set `layout_height="wrap_content"` and `layout_weight="1"` for each view.
 - C. Set `layout_height="0dp"` and `layout_weight="1"` for each view.**
 - D. Set `layout_height="0dp"` and assign `layout_weight` values of `1`, `2`, and `3` respectively.
15. Which XML layout parameter instructs a view to size itself just large enough to fit its own content?
- A. match_constraints
 - B. match_parent
 - C. fill_parent
 - D. wrap_content**

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16. What is the key advantage of separating the UI presentation (XML) from the application's behavior (Kotlin/Java)?
- A. XML layouts are guaranteed to run faster than layouts created programmatically.
 - B. It prevents the use of third-party libraries for UI elements.
 - C. It is a security feature that encrypts the user interface elements.
 - D. It allows the UI to be modified without needing to recompile the application's source code.**
17. What is the purpose of the Logcat tool window in Android Studio?
- A. To manage and install virtual devices (emulators).
 - B. To view the hierarchy of UI components in the current layout.
 - C. To browse the project's file structure and directories.
 - D. To display real-time system and application messages for debugging.**
18. In the Android Studio debugger, what does the 'Step Over' action do?
- A. It resumes program execution until the next breakpoint is hit.
 - B. It executes the currently highlighted line and moves to the next line in the current method, without entering any function calls on that line.**
 - C. It terminates the debugging session and stops the application.
 - D. It navigates into the source code of any method called on the currently highlighted line.
19. An Android developer wants to add 16dp of space between the border of a `Button` and its text content. Which XML attribute should they use?
- A. `android:layout_margin="16dp"`
 - B. `android:gravity="16dp"`
 - C. `android:spacing="16dp"`
 - D. `android:padding="16dp"`**
20. To make a `TextView` expand to fill the entire width of its parent `LinearLayout`, which size property should be used?
- A. `android:layout_width="match_parent"`**
 - B. `android:layout_width="wrap_content"`
 - C. `android:layout_gravity="fill_horizontal"`
 - D. `android:layout_height="match_parent"`
21. In a `RelativeLayout`, you want to position `Button_B` immediately below `Button_A`. Which attribute should be added to the XML for `Button_B`?
- A. `android:layout_alignBottom="@id/Button_A"`
 - B. `android:layout_below="@id/Button_A"`**
 - C. `android:layout_alignParentBottom="true"`
 - D. `android:layout_toRightOf="@id/Button_A"`
22. What is the primary function of the `orientation` attribute in a `LinearLayout`?
- A. To set the layout's position relative to its parent.
 - B. To distribute leftover space equally among all child views.
 - C. To specify if child views should be arranged in a single row or a single column.**
 - D. To align all child views to the center of the screen.
23. What is the key difference between the `gravity` and `layout_gravity` attributes?
- A. `gravity` controls horizontal alignment, and `layout_gravity` controls vertical alignment.
 - B. `gravity` adds external spacing (margin), while `layout_gravity` adds internal spacing (padding).
 - C. `gravity` is used for `LinearLayout`, while `layout_gravity` is used for `RelativeLayout`.

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D. `gravity` aligns the view's content, while `layout_gravity` aligns the view itself within its parent.

24. What is the fundamental purpose of using XML for Android UI development?

A. To separate the user interface design from the application's behavior and logic.

B. To ensure the application runs faster than if the UI were built programmatically.

C. To automatically adapt the UI for both mobile phones and tablets without extra code.

D. To enable the use of basic UI elements like `TextView` and `Button`.

25. What happens if you place several child views inside a `RelativeLayout` but do not specify any positioning attributes for them?

A. An error will occur, as positioning attributes are mandatory for all children.

B. They will not be visible until their positions are defined.

C. They will be stacked vertically, similar to a vertical `LinearLayout`.

D. They will all be drawn at the top-left corner of the layout, overlapping each other.

26. Which of the following best describes a `ViewGroup` in the context of Android UI structure?

A. A special type of view that acts as a container to hold and arrange other views.

B. A basic UI element that displays text or images, such as `TextView` or `ImageView`.

C. The Kotlin class that controls the logic and user interactions for a layout.

D. A file that defines the colors and styles for the application's user interface.

27. When an Android Activity is first launched, what is the correct sequence of lifecycle methods called to bring it to the foreground?

A. onStart() → onCreate() → onResume()

B. onCreate() → onResume()

C. onLaunch() → onStart() → onResume()

D. onCreate() → onStart() → onResume()

28. A user is interacting with an app and a phone call comes in, displaying a full-screen call interface. Which lifecycle methods are called on the app's Activity in what order?

A. onPause(), followed by onStop()

B. Only onPause()

C. onStop(), followed by onDestroy()

D. onStop(), followed by onRestart()

29. According to the provided best practices, which lifecycle method is the most appropriate place to initialize UI elements and bind data for the first time?

A. onRestart()

B. onResume()

C. onCreate()

D. onStart()

30. What is the primary distinction between the state an Activity is in after `onPause()` versus after `onStop()`?

A. After onPause(), the Activity is partially visible, whereas after onStop(), it is completely hidden.

B. Resources are released in onPause(), while data is saved in onStop().

C. The Activity can be killed by the system only after onStop(), not after onPause().

D. onPause() always leads to onResume(), while onStop() always leads to onDestroy().

31. Where should you perform tasks like releasing network connections or database handles?

A. In onResume(), to clean up before the user interacts again.

B. In onPause(), because the activity is no longer in the foreground.

C. In onStop() or onDestroy(), as the UI is no longer visible.

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- D. In `onCreate()`, to ensure resources are available immediately.
32. Which lifecycle method represents the final opportunity for an Activity to clean up its resources before it is permanently removed from memory?
- A. `onStop()`
 - B. App process killed
 - C. `onPause()`
 - D. **`onDestroy()`**
33. What is the primary function of an Intent in the Android operating system?
- A. **To serve as a messaging object that describes an operation to be performed.**
 - B. To manage the user interface layout and view hierarchy.
 - C. To define the permissions an application requires to run.
 - D. To store persistent application data locally on the device.
34. A developer wants to start a specific activity, `SettingsActivity`, from the `MainActivity` within their own application. What type of Intent should they use?
- A. Broadcast Intent
 - B. Implicit Intent
 - C. **Explicit Intent**
 - D. Service Intent
35. Where must an `<intent-filter>` be declared to allow an activity to respond to implicit intents from other apps?
- A. **In the `AndroidManifest.xml` file, inside the `<activity>` element.**
 - B. Programmatically within the `onCreate()` method of the Activity.
 - C. In the `build.gradle` file for the application module.
 - D. In a separate XML file located in the `res/xml/` directory.
36. What happens if an implicit intent is dispatched and the system finds multiple applications that can handle the request?
- A. An error is thrown, and the application crashes.
 - B. The system selects the app that has been designated as the default for that action.
 - C. **The Android system displays a chooser dialog for the user to select an app.**
 - D. The application that was installed first is automatically launched.
37. Which method is used to attach a piece of data, such as a username string, to an Intent before starting a new activity?
- A. `intent.attachData()`
 - B. **`intent.putExtra()`**
 - C. `intent.setData()`
 - D. `intent.addExtras()`
38. In the receiving activity, how do you retrieve a string value that was passed with the key `"username"`?
- A. **`val name = getIntent().getStringExtra("username")`**
 - B. `val name = getIntent().getBundle().getString("username")`
 - C. `val name = Intent.getString("username")`
 - D. `val name = getExtra("username")`
39. An Intent Filter is composed of which of the following elements to describe the type of intents it can handle?
- A. Activity, Class, and Package
 - B. Component, Extra, and Uri
 - C. **Action, Category, and Data**

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- D. Action, Service, and Broadcast
40. Which of the following is a classic example of using an Implicit Intent?
- A. Requesting to open a web URL, allowing the user to choose their preferred browser.**
 - B. Navigating from a list screen to a detail screen within the same news app.
 - C. Starting a background service to download a file in your own application.
 - D. Creating a new `SecondActivity` instance from `MainActivity` using `Intent(this, SecondActivity::class.java)`.
41. What are the three fundamental components you must define when using the `registerForActivityResult` API in Android?
- A. An Intent, a result code, and a callback.
 - B. A launcher, a contract, and a callback.**
 - C. A manifest declaration, a permission check, and a launcher.
 - D. An Activity, an Intent, and a `finish()` call.
42. According to the permissions workflow diagram, what is the immediate step after you declare a necessary permission in your app's manifest file?
- A. Check if the permission is a runtime permission.**
 - B. Fulfill the use case without any further action.
 - C. Request the user to grant the permission at runtime.
 - D. Check if functionality can be provided without permissions.
43. Which built-in `ActivityResultContract` is designed specifically for requesting a single runtime permission, such as `android.Manifest.permission.CAMERA`?
- A. `StartActivityForResult`
 - B. `RequestMultiplePermissions`
 - C. `RequestPermission`**
 - D. `GetContent`
44. When using `registerForActivityResult` with an explicit intent to get data back from a `SecondActivity`, how does the `SecondActivity` send the result back to the `MainActivity`?
- A. It puts the data directly into the `MainActivity`'s `iv.setImageURI()` method.
 - B. It calls `finish()` without any other methods.
 - C. It calls `setResult()` with a result code and an Intent, then calls `finish()`.**
 - D. It creates a new launcher pointing back to the MainActivity.
45. What is the purpose of the callback function in the `registerForActivityResult` structure?
- A. To launch the intent that starts the new activity or permission request.
 - B. To define the type of contract being used, such as `RequestPermission`.
 - C. To define the action that should be taken once a result is returned.**
 - D. To check if a permission has already been granted before making a request.
46. Which function call is used to start the process of asking for a permission after a permission launcher has been registered?
- A. `ContextCompat.checkSelfPermission(this, permission)`
 - B. `registerForActivityResult(ActivityResultContracts.RequestPermission())`
 - C. `setResult(RESULT_OK, intent)`
 - D. `requestPermissionLauncher.launch(android.Manifest.permission.CAMERA)`**
47. Which of the following data storage scenarios is the most suitable for using SharedPreferences?
- A. Saving a multi-megabyte video file downloaded by the user.
 - B. Caching a complex, relational dataset of customer contacts and orders.

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- C. Logging detailed, private application performance metrics for debugging.
 - D. Storing a user's preference for a light or dark application theme.**
48. What is the immediate result of calling the `edit()` method on a `SharedPreferences` object?
- A. It immediately saves all pending changes to the preference file.
 - B. It returns an instance of the `SharedPreferences.Editor` class.**
 - C. It clears all existing key-value pairs from the preference file.
 - D. It returns a `Map` containing all the current key-value pairs.
49. If an application saves a user's high score using `SharedPreferences` and is then forcefully closed by the operating system, what will happen to the high score data?
- A. The data is corrupted and the `SharedPreferences` file becomes unreadable.
 - B. The data is saved, but can only be accessed after the device is rebooted.
 - C. The data persists and will be available the next time the application is launched.**
 - D. The data is lost permanently as it was only held in memory.
50. Which method must be called on a `SharedPreferences.Editor` instance to finalize and save any changes made?
- A. `save()`
 - B. `write()`
 - C. `commit()`**
 - D. `apply()`
51. When creating a `SharedPreferences` file with `getSharedPreferences()`, what does the `MODE_PRIVATE` flag signify?
- A. The data within the file is automatically encrypted by the system.
 - B. The file can only be accessed by the application that created it.**
 - C. Only the user who is currently logged in can access the file.
 - D. The file is deleted automatically when the application is uninstalled.
52. An application needs to store a large, structured inventory of products, including names, prices, and stock counts. Which data management option is the most appropriate choice?
- A. Internal Storage
 - B. SQLite databases**
 - C. `SharedPreferences`
 - D. External Storage
53. What is the correct sequence of method calls to store a user's name (a string) in `SharedPreferences`?
- A. `edit()`, then `commit()`, then `putString()`
 - B. `putString()`, then `edit()`, then `apply()`
 - C. `commit()`, then `edit()`, then `putString()`
 - D. `edit()`, then `putString()`, then `commit()`**
54. If a developer wants to allow any other application on the device to read the preference file but not change it, which mode should be used?
- A. `MODE_SHARED`
 - B. `MODE_WORLD_WRITEABLE`
 - C. `MODE_PRIVATE`
 - D. `MODE_WORLD_READABLE`**
55. What is the primary reason for using a `RecyclerView` to display large data sets?
- A. It reuses a limited number of View elements for new data items as they are scrolled onto the screen.**

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- B. It provides more advanced visual styling options than a standard ListView.
 - C. It is the only component capable of displaying a list of items on modern Android versions.
 - D. It automatically creates a new View for every single item in the data set to ensure high quality.
56. In a RecyclerView, what is the specific role of the LayoutManager?
- A. It holds the references to the UI components for a single list item, like TextViews and ImageViews.
 - B. It handles the organization and positioning of UI components within the RecyclerView.**
 - C. It connects the data source to the RecyclerView and creates ViewHolders.
 - D. It defines the visual structure and design for a single row in an XML file.
57. What happens when a user scrolls through a list and a ViewHolder moves off-screen?
- A. The data within the ViewHolder is cleared, but the view itself remains on-screen but hidden.
 - B. The ViewHolder is added to a permanent cache that never gets cleared.
 - C. The ViewHolder is saved so it can be re-bound to new data for an item scrolling onto the screen.**
 - D. The ViewHolder is immediately destroyed to free up memory.
58. Which component is responsible for preparing a single View with data for one list item?
- A. The ViewHolder**
 - B. The Activity
 - C. The LayoutManager
 - D. The RecyclerView itself
59. Based on the diagram showing how components fit together, what is the flow of information?
- A. Activity -> Adapter -> Data
 - B. Data -> Adapter (with ViewHolder) -> Activity (with RecyclerView)**
 - C. ViewHolder -> Data -> RecyclerView
 - D. Layout Manager -> ViewHolder -> Item
60. Which of these is NOT listed as a direct component of a RecyclerView implementation in the slides?
- A. Layout for one item of data
 - B. Adapter
 - C. A database helper class**
 - D. An array of Data
61. What is the function of extending `RecyclerView.Adapter`?
- A. To define the on-screen arrangement of items, such as a grid or a list.
 - B. To specify the XML layout file that contains the RecyclerView element.
 - C. To provide the core scrolling functionality and view recycling logic.
 - D. To create the methods that bind your app's data set to the views displayed within the RecyclerView.**
62. What is the primary benefit of Firebase for developers, as described in the lecture?
- A. It is a suite of tools exclusively for designing and prototyping user interfaces.
 - B. It allows for the rapid development of apps by handling backend infrastructure management.**
 - C. It provides a new, proprietary programming language for faster mobile development.
 - D. It offers free physical servers that developers can configure for their applications.
63. According to the provided information, which company acquired Firebase in 2014, making it their flagship offering for app development?
- A. Twitter
 - B. Crashlytics

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- C. Facebook
 - D. Google**
64. The circular diagram in the presentation categorizes Firebase products around a central service. Which category would you find services like 'Realtime Database', 'Authentication', and 'Storage'?
- A. EARN
 - B. ANALYTICS
 - C. DEVELOP**
 - D. GROW
65. Which Firebase feature allows developers to modify their app's behavior or appearance without needing to deploy a new version to the app store?
- A. App Distribution
 - B. Dynamic Links
 - C. Cloud Messaging
 - D. Remote Config**
66. What is the primary purpose of using Firebase Authentication in an application?
- A. To analyze user behavior and create segments based on predicted actions.
 - B. To identify users, enabling personalized experiences and secure cloud data storage.**
 - C. To track app crashes and performance issues in real-time.
 - D. To monetize the application by integrating targeted advertisements.
67. In addition to email/password and phone number, Firebase Authentication supports several federated identity providers. Which of the following is NOT listed as a supported 'Sign In with' provider in the slides?
- A. Facebook
 - B. GitHub
 - C. LinkedIn**
 - D. Google
68. According to the lecture, what is the fundamental data structure used by the Firebase Realtime Database?
- A. A series of XML documents
 - B. A graph of interconnected objects
 - C. A JSON tree**
 - D. A collection of SQL tables
69. When comparing Firebase's two database offerings, what is a primary advantage of using Cloud Firestore over the Realtime Database?
- A. It is the original Firebase database, ensuring maximum compatibility.
 - B. It exclusively uses a table-and-record data model.
 - C. It exclusively uses a table-and-record data architecture.
 - D. It features richer, faster queries and scales further.**
70. What is the recommended best practice for structuring data in the Firebase Realtime Database to ensure efficient data retrieval?
- A. Nest data as deeply as possible to group related information.
 - B. Use semantic names for all keys instead of pushed IDs.
 - C. Avoid deep data nesting and keep the structure as flat as possible.**
 - D. Ensure every node has at least 3 levels of children.

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71. Which Kotlin code snippet correctly demonstrates how to add a new element to a list in the Realtime Database, allowing Firebase to generate a unique key?
- A. `db.addValue(data)`
 - B. **`db.push().setValue(data)`**
 - C. `db.getReference("chat").update(data)`
 - D. `db.setValue(data)`
72. What happens to a mobile app using the Firebase Realtime Database if the device loses its network connection?
- A. **The app continues to function using a local cache and syncs automatically when reconnected.**
 - B. The app will crash immediately, as a constant connection is required.
 - C. All pending writes fail and must be manually retried by the user.
 - D. The app can only read cached data but cannot write any new data.
73. When mapping data from the Realtime Database to a custom Kotlin object, what special requirement must the data class fulfill?
- A. All properties must be declared as nullable types.
 - B. **It must have a default constructor that takes no arguments.**
 - C. It must implement the `FirebaseData` interface.
 - D. The class name must exactly match the key in the JSON tree.
74. In the context of Firebase Realtime Database Security Rules, what does the rule `"".read": "auth != null"` typically enforce?
- A. Data can only be read if the request contains non-null data.
 - B. Only users with administrative privileges can read the data.
 - C. **Only authenticated (signed-in) users are allowed to read the data.**
 - D. Data can be read by anyone, including unauthenticated users.
75. In the provided Firebase Storage code, which method is called on a `StorageReference` to begin the process of uploading a file from a local `Uri`?
- A. **`putFile(file)`**
 - B. `uploadFile(file)`
 - C. `getInstance(file)`
 - D. `saveFile(file)`
76. After a file is successfully uploaded to Firebase Storage, how is its public download URL retrieved within the success listener?
- A. By querying the `FirestoreStorage` instance with the file path
 - B. By calling `storageRef.getUrl()` immediately after `putFile()`
 - C. It is automatically passed as a String argument to `onSuccess()`
 - D. **By accessing `taskSnapshot.getDownloadUrl()`**
77. According to the lecture notes, which code snippet correctly initiates the process of picking an image file from the device's storage?
- A. `iv.setImageURI(it)`
 - B. `ActivityResultContracts.GetContent()`
 - C. `iv.setOnClickListener { pickImage() }`
 - D. **`launcher.launch("image/*")`**
78. What is the correct sequence of operations to convert a selected image `Uri` into a Base64 string for storage in the Realtime Database?
- A. Decode the Uri using Base64, read it into an `InputStream`, then convert to a `ByteArray`.
 - B. **Open an `InputStream` from the Uri, read it into a `ByteArray`, then encode the `ByteArray` to a Base64 string.**

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- C. Convert the Uri to a Bitmap, get the bytes from the Bitmap, then encode to a Base64 string.
 - D. Encode the Uri directly to a Base64 string, then create a ByteArray from the string.
79. To display an image stored as a Base64 string, what is the first step in the conversion process?
- A. Open an `InputStream` from the Base64 string.
 - B. Use `BitmapFactory.decodeByteArray()` on the string.
 - C. Use `Base64.decode()` to convert the string into a byte array.**
 - D. Create a new `File` from the Base64 string.
80. Which two classes are essential for converting a decoded byte array back into a displayable image format that can be set on an `ImageView`?
- A. `BitmapFactory` and `Bitmap`**
 - B. `Base64` and `InputStream`
 - C. `File` and `Uri`
 - D. `ContentResolver` and `ByteArray`
81. What is the primary role of the `onCreate(SQLiteDatabase db)` method within a custom `SQLiteOpenHelper` subclass?
- A. To execute the initial SQL statements for table creation when the database is first accessed.**
 - B. To open a readable or writable connection to the database.
 - C. To handle schema updates when the database version number increases.
 - D. To execute a query and return a `Cursor` object with the results.
82. When retrieving data from an SQLite query in Android, what object is returned that allows for iteration over the result set?
- A. `SQLiteDatabase` object.
 - B. An `SQLiteQueryBuilder` object.
 - C. A `Cursor` object.**
 - D. A `ContentValues` object.
83. The `onUpgrade()` method in `SQLiteOpenHelper` is automatically triggered under which condition?
- A. The version number in the code is greater than the database's current version on the device.**
 - B. The database file is not found on the device.
 - C. The application is uninstalled and then reinstalled.
 - D. A `'DROP TABLE'` command is executed manually.
84. Why is it recommended to perform database operations asynchronously in Android?
- A. Because the `getWritableDatabase()` method can only be called from a background thread.
 - B. Because accessing the file system can be slow and may block the main UI thread.**
 - C. To prevent other applications from accessing the database concurrently.
 - D. To ensure that the `Cursor` implementation is synchronized across multiple threads.
85. In a `db.query()` call, which parameter is used to specify the list of columns to be returned in the result set?
- A. `sortOrder`
 - B. `selectionArgs`
 - C. `selection`
 - D. `projectionIn`**
86. What is the return value of the `db.insert()` method if the operation fails?
- A. `0`
 - B. It throws an `SQLException`.
 - C. `null`

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D. ``-1``

87. After executing a query, you have a ``Cursor`` object. Which sequence of method calls is typically used to loop through all the rows in the result set?

- A. A ``while (cursor.moveToFirst())`` loop.
- B. A ``while(cursor.hasNext())`` loop, similar to an Iterator.
- C. A ``for`` loop from 0 to ``cursor.getCount()`` using ``cursor.moveToNext()``.
- D. **An ``if (cursor.moveToFirst())`` followed by a ``do-while (cursor.moveToNext())`` loop.**

88. Which of the following is NOT a native data type directly supported by SQLite as listed in the source material?

- A. ``INTEGER``
- B. ``REAL``
- C. **``STRING``**
- D. ``TEXT``

89. According to the provided best practices, why should you avoid closing the database after every single operation?

- A. Because it can lead to data corruption if not closed properly.
- B. **Because ``getWritableDatabase()`` and ``getReadableDatabase()`` are expensive calls to make.**
- C. Because Android's garbage collector automatically handles closing the connection.
- D. Because it prevents the ``onUpgrade`` method from ever being called.

[CLO-3 Design and implement mobile applications integrating APIs, maps, notifications, and background services.]

90. Which component of an Android notification is designated as required and must be set using the ``setSmallIcon()`` method?

- A. Large icon
- B. **Small icon**
- C. Title
- D. App name

91. What is the primary function of a ``NotificationChannel`` in Android development, especially for versions 8.0 (API level 26) and higher?

- A. To assign a unique ID to each notification for future updates.
- B. To define the visual layout and template for every notification.
- C. **To group notifications into categories that users can manage and customize.**
- D. To create a direct communication link with Firebase Cloud Messaging.

92. Which class is used as a factory to configure and create a notification's content, icon, and title?

- A. ``PendingIntent``
- B. **``NotificationCompat.Builder``**
- C. ``NotificationManager``
- D. ``FirebaseMessagingService``

93. By default, the Android system provides the notification's time stamp. How can a developer hide this time stamp from appearing?

- A. By omitting the ``setWhen()`` call
- B. **Using ``setShowWhen(false)``**
- C. Using ``setTimestamp(null)``
- D. Using ``setWhen(0)``

94. What is the primary reason for assigning a specific notification ID when calling ``notificationManager.notify()``?

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- A. To allow the app to update or cancel that specific notification later.**
 - B. To ensure the notification is delivered with high importance.
 - C. To track whether the user has clicked on the notification.
 - D. To categorize the notification into a `NotificationChannel`.
- 95. To make a notification interactive, such as opening an activity when tapped, which component must be created and associated with it?
 - A. A NotificationChannel
 - B. A RemoteMessage object
 - C. An IntentFilter
 - D. A PendingIntent**
- 96. According to the lecture, push notifications are most effective when used for what type of content?
 - A. Time-sensitive information and re-engagement**
 - B. Application tutorials and help guides
 - C. Promotional advertisements for the app
 - D. Daily summaries of app usage statistics
- 97. In the provided code for `MyFirebaseMessagingService`, which method is the entry point for handling a newly arrived message from Firebase?
 - A. `onMessageReceived()`**
 - B. `showNotification()`
 - C. `createNotificationChannel()`
 - D. `getSystemService()`
- 98. According to the principles of a RESTful web service, which HTTP method should be used to create a new resource on the server?
 - A. PUT
 - B. POST**
 - C. DELETE
 - D. GET
- 99. Based on the provided PHP code for inserting a contact, what is the purpose of the `json_encode(\$response)` function?
 - A. To connect to the MySQL database using JSON credentials.
 - B. To decode an incoming JSON request into a PHP array.
 - C. To execute a database query using JSON data.
 - D. To convert the PHP array into a JSON formatted string for the API response.**
- 100. Which of the following is listed as a primary characteristic of MySQL in the lecture material?
 - A. It is a complex system that is difficult to use.
 - B. It is a paid software distributed by Microsoft.
 - C. It is suitable for both small and large applications.**
 - D. It runs directly on client devices like smartphones and browsers.
- 101. In the `insert.php` code snippet, how does the script access the phone number sent in the POST request?
 - A. \$_POST['phno']**
 - B. \$_GET['phno']
 - C. phno.value

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D. `$_SESSION['phno']`

102. A client requests a resource that does not exist on the server. According to the list of HTTP status codes provided, which code should the API return?

- A. 500 Internal Server Error
- B. 404 Not Found**
- C. 403 Forbidden
- D. 400 Bad Request

103. What is the primary function of the XAMPP software as shown in the lecture slides?

- A. To manage and deploy the application to a live web hosting service.
- B. To provide a local server environment including Apache and MySQL.**
- C. To write and edit PHP and SQL code in a text editor.
- D. To directly test REST API endpoints with POST and GET requests.

104. In the PHP code that retrieves all contacts, what is the purpose of the ``while ($row = mysqli_fetch_array($res))`` loop?

- A. To execute the SQL query multiple times.
- B. To create a new table row in the HTML output.
- C. To iterate through each row of the result set returned by the SQL query.**
- D. To connect to the database for each contact.

105. What does the acronym REST stand for in the context of web services?

- A. Resource Enabled State Transfer
- B. REpresentational State Transfer**
- C. Remote Execution Service Technology
- D. Reliable and Secure Transactions

106. According to the steps for making web APIs, what action is performed immediately after writing the query for inserting a record?

- A. Make a connection with the database.
- B. Create Table if required.
- C. Generate a Json response accordingly.**
- D. Test the WebService.

107. In the SQL ``CREATE TABLE`` statement for ``contacts``, what is the purpose of ``PRIMARY KEY (`id`)``?

- A. To sort the table by the ``id`` column by default.
- B. To automatically increase the value of ``id`` for each new contact.
- C. To ensure that every contact must have an ID.
- D. To make the ``id`` column the main way to uniquely identify each record in the table.**

108. An Android application needs to send sensitive user registration data, including a password and personal details, to a server to create a new account. Which HTTP method is most appropriate for this task?

- A. GET
- B. OPTIONS
- C. POST**
- D. HEAD

109. A developer is building a news feed app that must handle a high volume of small, frequent requests for headlines and thumbnails.

Which networking library is specifically highlighted as being excellent for this use case due to its scheduling and caching features?

- A. Retrofit
- B. Picasso

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- C. **Volley**
- D. OkHttp

110. What is the primary role of the Header Variables in an HTTP message structure?

- A. To report the result of the request, such as '200 OK' or '401 Unauthorized'.
- B. To contain the actual data being sent, such as a JSON object.
- C. **To provide metadata about the request or response, like content type.**
- D. To define the action being requested, such as 'GET' or 'POST'.

111. Which core Android class would a developer use to represent a JSON structure that begins with '{' and contains a collection of name/value pairs?

- A. **JSONObject**
- B. ConnectivityManager
- C. JSONTokener
- D. JSONArray

112. A developer runs their Flask server and tries to connect from a mobile app, but the connection times out. The Flask server logs show no incoming requests. What is the most likely cause of this issue?

- A. The server's firewall is blocking the connection port.
- B. Android's security policy is blocking unencrypted network traffic.
- C. **The Flask server is only listening for connections from the local machine.**
- D. The mobile app is configured to connect to the wrong IP address.

113. To make a Flask development server accessible to other devices on the network, which configuration should be used when starting the app?

- A. `app.run(port=8080)`
- B. `app.run(debug=True)`
- C. **`app.run(host='0.0.0.0')`**
- D. `app.run(host='127.0.0.1')`

114. When developing with real device, which IP address should be used in the mobile app's code to connect to a server running on the host machine?

- A. 10.0.2.2
- B. 0.0.0.0
- C. 127.0.0.1
- D. **The host machine's local network IP (e.g., 192.168.1.5)**

115. After configuring the Flask server to be externally visible, an app now fails immediately with a 'SocketException: OS Error: Connection refused'. What is the most probable cause?

- A. **The host machine's operating system firewall is blocking the port.**
- B. The server is running on 'localhost' instead of '0.0.0.0'.
- C. The Android app does not have permission to access the internet.
- D. The Flask server has crashed or is not running.

116. An Android app successfully connects to the Flask server, but then immediately throws a 'Cleartext HTTP traffic not permitted' exception. What is the underlying reason for this security measure?

- A. The local network does not allow unencrypted communication.
- B. The Flask server is configured to only accept HTTPS connections.
- C. **The app is missing the INTERNET permission in its manifest.**

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D. **Modern Android versions disable unencrypted (HTTP) traffic by default.**

117. For initial testing, what is the quickest way to resolve the 'Cleartext HTTP traffic not permitted' error during local development?

- A. Use the IP address '10.0.2.2' instead of a domain name.
- B. **Add 'android:usesCleartextTraffic="true"' to the application tag in AndroidManifest.xml.**
- C. Change the server URL in the app from 'http://' to 'https://'.
- D. Configure a firewall rule to allow HTTP traffic.

118. What is the primary benefit of using 'manifestPlaceholders' in 'build.gradle' to manage cleartext traffic permissions?

- A. It forces the Flask server to upgrade its connection to HTTPS automatically.
- B. It completely replaces the need for an AndroidManifest.xml file.
- C. **It allows enabling cleartext traffic for debug builds while keeping it disabled for secure release builds.**
- D. It is the only way to allow HTTP traffic to the emulator alias '10.0.2.2'.

119. The principle 'The Network is Part of Your Stack' implies that developers should:

- A. Ensure their server code is secure and free of vulnerabilities.
- B. Always use HTTPS to encrypt all data in transit.
- C. **Treat firewalls and network configurations as integral components of the application's environment.**
- D. Make sure the server is explicitly told what address to listen on for connections.

120. What is the primary purpose of a Broadcast Receiver in the Android ecosystem?

- A. To perform long-running operations in the background without a user interface.
- B. **To serve as a messaging system that allows apps and the system to communicate events.**
- C. To manage and display the user interface elements for an application.
- D. To store and retrieve persistent application data in a structured manner.

121. An application needs to send sensitive information between its own components without exposing it to other applications. Which type of broadcast is most suitable for this task?

- A. Secure Broadcast
- B. **Local Broadcast**
- C. System Broadcast
- D. Custom Broadcast

122. When registering a Broadcast Receiver dynamically in your code (context-registered), what crucial step must be taken to prevent memory leaks?

- A. Set the receiver instance to null in the 'onDestroy()' method.
- B. Declare the receiver in the 'AndroidManifest.xml' file as a backup.
- C. **Unregister the receiver using 'unregisterReceiver()' when it's no longer needed.**
- D. Call the 'sendBroadcast()' method in the 'onStop()' lifecycle event.

123. Which method must be implemented within a 'BroadcastReceiver' subclass to handle an incoming broadcast message?

- A. onHandleBroadcast(Intent)
- B. onStartCommand(Intent, int, int)
- C. onCreate(Bundle)
- D. **onReceive(Context, Intent)**

124. How does an application initiate the sending of a custom, system-wide broadcast?

- A. By calling 'LocalBroadcastManager.getInstance().sendBroadcast()'.
- B. **By creating an Intent and passing it to the 'sendBroadcast()' method.**
- C. By defining a '<sender>' tag in the 'AndroidManifest.xml'.

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D. By creating an instance of `BroadcastReceiver` and calling its `start()` method.

125. What is the role of an `IntentFilter` when registering a Broadcast Receiver?

- A. It is a security mechanism that encrypts the data within the broadcast.
- B. It creates the Intent object that will be sent as the broadcast.
- C. It specifies the types of broadcast Intents a component is interested in receiving.**
- D. It executes the code inside the `onReceive()` method when a broadcast arrives.

126. Which of the following is an example of an action string for a standard system broadcast?

- A. `registerReceiver(receiver, filter)`
- B. `Intent.ACTION_BOOT_COMPLETED`**
- C. `android.permission.RECEIVE_SMS`
- D. `my.own.action.name`

127. When declaring a `BroadcastReceiver` in the `AndroidManifest.xml` file, what is the purpose of the `<action>` tag inside the `<intent-filter>`?

- A. To list the specific broadcast action strings (e.g., `android.intent.action.AIRPLANE_MODE`) that the receiver should listen for.**
- B. To define the custom code that will execute when the broadcast is received.
- C. To set the permissions required for other apps to send a broadcast to this receiver.
- D. To specify the name of the Java or Kotlin class that handles the broadcast.

128. What is the primary role of an Android Service in an application?

- A. To create and manage new threads for short-term operations while the app is visible.
- B. To manage the main application thread to prevent it from blocking.
- C. To perform long-running operations in the background without a direct UI.**
- D. To provide a user interface for tasks that run in the background.

129. An app that plays music must continue playing even when the user navigates away. What type of service is most suitable for this, and what is its specific requirement?

- A. A Bound Service, because the user interface needs to communicate with it to pause or play.
- B. A Background Service, because it performs an operation not directly noticed by the user.
- C. A Foreground Service, because it must display a Notification to the user.**
- D. A Started Service, which requires a call to `stopService()` from the main activity.

130. What is the expected behavior of the `onCreate()` method in a Service's lifecycle?

- A. It is called when a client binds to the service using `bindService()`.
- B. It is called only once to perform initial setup when the service is first created.**
- C. It is called every time a component calls `startService()`.
- D. It is called to clean up resources just before the service is destroyed.

131. Which service lifecycle method must you always implement, even if you simply return null to disallow connections?

- A. `onBind()`**
- B. `onDestroy()`
- C. `onStartCommand()`
- D. `onCreate()`

132. A 'started' service begins a file download. After the download is complete, what is the proper way for the service to terminate?

- A. Let the `onStartCommand()` method finish, which automatically stops the service.
- B. Wait for the component that started it to call `stopService()`.

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- C. Call the `onDestroy()` method directly from within the service.
- D. **Call `stopSelf()` from within the service to signal its work is done.**

[CLO-4 Utilize modern mobile development tools and environments (Android Studio, Flutter) for app creation.]

133. What is the primary advantage of Flutter's 'single codebase' approach as described in the lecture materials?
- A. It provides separate, highly optimized native codebases for each target platform.
 - B. It compiles code faster than any native development language for a single platform.
 - C. **It allows for building applications for multiple platforms like iOS, Android, web, and desktop from one set of code.**
 - D. It automatically converts existing native Android and iOS apps into a single Flutter app.
134. Which Flutter feature allows a developer to see code changes reflected in the app almost instantly, without losing the current application state?
- A. StatefulWidget
 - B. **Hot Reload**
 - C. Native Compilation
 - D. SDKs & Native Features Access
135. If you need to create a UI element that changes based on user interaction, such as a checkbox that can be toggled on and off, which type of widget should you use?
- A. StatelessWidget
 - B. Scaffold
 - C. Container
 - D. **StatefulWidget**
136. According to the slides, Flutter's performance is 'smooth' and 'jank-free' because it compiles to what?
- A. A JavaScript bundle that communicates with native components via a bridge.
 - B. HTML and CSS code rendered within a native web view.
 - C. **Native ARM machine code for mobile and desktop.**
 - D. A platform-agnostic bytecode that runs in a Dart virtual machine.
137. What is the fundamental principle behind structuring a UI in Flutter?
- A. Configuration, where the UI is defined entirely in a separate markup file like XML.
 - B. Inheritance, where complex widgets extend the functionality of simpler base widgets.
 - C. Separation of concerns, where UI layout and logic are kept in completely different file types.
 - D. **Composition, where the UI is built by nesting widgets inside each other to form a widget tree.**
138. Which widget would you use to implement a basic Material Design visual layout that includes an AppBar, Drawer, and a Floating Action Button (FAB)?
- A. **Scaffold**
 - B. Stack
 - C. Column
 - D. Container
139. In a StatefulWidget, what is the primary purpose of calling the `setState()` method?
- A. To create a new instance of the widget with updated values.
 - B. To save the widget's current data to the device's local storage.
 - C. To directly manipulate the widget's appearance on the screen without a rebuild.

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D. To tell the framework that the widget's state has changed, triggering a rebuild of the UI.

140. To detect a user's swipe or long-press on an image, which is not an interactive widget by default, you should wrap the image widget with a:

- A. ElevatedButton
- B. GestureDetector**
- C. Container
- D. StatefulWidget

141. In a `Row` widget, which axis represents the horizontal direction where children are aligned?

- A. Alignment Axis
- B. Vertical Axis
- C. Main Axis**
- D. Cross Axis

142. Which programming language powers the Flutter framework?

- A. Dart**
- B. Kotlin
- C. JavaScript
- D. Java

143. In a standard Flutter project, which directory is considered the 'heart' of the application, containing the vast majority of your Dart code and UI logic?

- A. test/
- B. android/
- C. ios/
- D. lib/**

144. What is the primary purpose of the `pubspec.yaml` file in a Flutter project?

- A. To manage project metadata, dependencies, and asset declarations.**
- B. To define the application's visual theme and color scheme.
- C. To store native code and configurations for Android and iOS.
- D. To write unit tests for the application's widgets.

145. Which function serves as the initial entry point for execution in every Flutter application?

- A. void main()**
- B. runApp()
- C. build()
- D. MaterialApp()

146. Within a `Scaffold` widget, which property is designated for holding the primary content of the screen?

- A. Body**
- B. floatingActionButton
- C. appBar
- D. bottomNavigationBar

147. When using a `Column` widget to arrange children, what is its 'Main Axis'?

- A. Vertical (Top to Bottom)**
- B. Horizontal (Left to Right)
- C. Depth (Front to Back)

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D. Diagonal (Top-Left to Bottom-Right)

148. If you are working with a `Row` widget, what direction does its 'Cross Axis' run?

- A. **Vertical (Top to Bottom)**
- B. It has no Cross Axis
- C. Horizontal (Left to Right)
- D. From the center outwards

149. Which property of a `Container` widget is used to add space outside of its border, pushing other widgets away?

- A. Padding
- B. Decoration
- C. **Margin**
- D. Alignment

150. To add a background color, rounded corners, and a shadow to a widget, which `Container` property would you use?

- A. padding
- B. style
- C. **decoration**
- D. margin

151. What is essential for managing a `BottomNavigationBar` to display the correct screen when a user taps a tab?

- A. **Managing an index state to track the active tab.**
- B. Wrapping the Scaffold in a Container widget.
- C. A list of icon data for each tab.
- D. Defining a separate `MaterialApp` for each tab.

152. You need to place a loading spinner exactly in the middle of the screen. Which layout widget is best suited for this specific task?

- A. Column
- B. Scaffold
- C. **Center**
- D. Container

153. A developer wants to make a custom-shaped container tappable, but does not want any visual feedback like a splash or ripple effect when the user presses it. Which widget is the most suitable choice for this task?

- A. Card
- B. Button
- C. **GestureDetector**
- D. InkWell

154. What is the primary performance benefit of using `ListView.builder` when displaying a large, dynamic list of items in Flutter?

- A. **It only builds the list items that are currently visible on the screen.**
- B. It automatically compresses the data for each list item.
- C. It pre-loads all list items into memory for faster access.
- D. It requires the entire list to be passed as a `children` property.

155. To use GetX for navigation, what is the first and most critical change that must be made to the application's root widget?

- A. Add a `GetObserver` to the `MaterialApp`'s `navigatorObservers` property.
- B. **Replace the `MaterialApp` widget with `GetMaterialApp`.**
- C. Wrap the `MaterialApp` widget in a `GetProvider` widget.
- D. Initialize GetX in the `main()` function using `Get.init()`.

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156. How does the GetX approach to passing data to a new screen differ from the traditional constructor method?
- A. GetX passes data as a map through the `Navigator.push` method.
 - B. GetX can only pass simple data types like strings and integers.
 - C. GetX requires defining a `final` variable and a constructor on the destination screen.
 - D. **GetX uses the `arguments` property in `Get.to()` and retrieves it with `Get.arguments`.**
157. Which statement accurately compares `Get.to()` with the traditional `Navigator.of(context).push()`?
- A. `Get.to()` is more verbose and requires more boilerplate code.
 - B. `Get.to()` requires a `BuildContext` to function, just like `Navigator.push()`.
 - C. **`Get.to()` provides a cleaner, more readable syntax that does not require `context`.**
 - D. `Get.to()` is functionally identical to `Navigator.pop()`.
158. According to the presentation, which of these is NOT listed as a primary pillar of the GetX framework?
- A. **Advanced UI Widget Library**
 - B. State Management
 - C. Dependency Injection
 - D. Route Management
159. When using the traditional constructor method to pass data, what must be done when calling `Navigator.push`?
- A. Wrap the destination widget with a `Get.to()` call.
 - B. Use the `arguments` property of the `MaterialPageRoute`.
 - C. **Pass the data as an argument to the destination widget's constructor.**
 - D. Store the data in a global variable before pushing the new route.
160. On the destination screen, how do you access data that was passed using `Get.to(DetailScreen(), arguments: 'some data')`?
- A. **By accessing the static property `Get.arguments`.**
 - B. By defining a constructor in `DetailScreen` that accepts the data.
 - C. By using `ModalRoute.of(context).settings.arguments`.
 - D. By calling a function like `Get.readArgument()`.

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2 ○ ○ ○ ○ ○ ○ ○ ○	36 ○ ○ ○ ○ ○	83 ○ ○ ○ ○ ○	128 ○ ○ ○ ○ ○
3 ○ ○ ○ ○ ○ ○ ○ ○	37 ○ ○ ○ ○ ○	84 ○ ○ ○ ○ ○	129 ○ ○ ○ ○ ○
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[CLO-1]	44 ○ ○ ○ ○ ○	[CLO-3]	133 ○ ○ ○ ○ ○
A B C D	A B C D	A B C D	134 ○ ○ ○ ○ ○
1 ○ ○ ○ ○ ○	45 ○ ○ ○ ○ ○	90 ○ ○ ○ ○ ○	135 ○ ○ ○ ○ ○
2 ○ ○ ○ ○ ○	46 ○ ○ ○ ○ ○	91 ○ ○ ○ ○ ○	136 ○ ○ ○ ○ ○
3 ○ ○ ○ ○ ○	47 ○ ○ ○ ○ ○	92 ○ ○ ○ ○ ○	137 ○ ○ ○ ○ ○
4 ○ ○ ○ ○ ○	48 ○ ○ ○ ○ ○	93 ○ ○ ○ ○ ○	A B C D
5 ○ ○ ○ ○ ○	49 ○ ○ ○ ○ ○	94 ○ ○ ○ ○ ○	138 ○ ○ ○ ○ ○
A B C D	A B C D	A B C D	139 ○ ○ ○ ○ ○
6 ○ ○ ○ ○ ○	50 ○ ○ ○ ○ ○	95 ○ ○ ○ ○ ○	140 ○ ○ ○ ○ ○
7 ○ ○ ○ ○ ○	51 ○ ○ ○ ○ ○	96 ○ ○ ○ ○ ○	141 ○ ○ ○ ○ ○
8 ○ ○ ○ ○ ○	52 ○ ○ ○ ○ ○	97 ○ ○ ○ ○ ○	142 ○ ○ ○ ○ ○
9 ○ ○ ○ ○ ○	53 ○ ○ ○ ○ ○	98 ○ ○ ○ ○ ○	A B C D
CLO2	54 ○ ○ ○ ○ ○	99 ○ ○ ○ ○ ○	143 ○ ○ ○ ○ ○
[CLO-2]	A B C D	A B C D	144 ○ ○ ○ ○ ○
A B C D	55 ○ ○ ○ ○ ○	100 ○ ○ ○ ○ ○	145 ○ ○ ○ ○ ○
10 ○ ○ ○ ○ ○	56 ○ ○ ○ ○ ○	101 ○ ○ ○ ○ ○	146 ○ ○ ○ ○ ○
11 ○ ○ ○ ○ ○	57 ○ ○ ○ ○ ○	102 ○ ○ ○ ○ ○	147 ○ ○ ○ ○ ○
12 ○ ○ ○ ○ ○	58 ○ ○ ○ ○ ○	103 ○ ○ ○ ○ ○	A B C D
13 ○ ○ ○ ○ ○	59 ○ ○ ○ ○ ○	104 ○ ○ ○ ○ ○	148 ○ ○ ○ ○ ○
14 ○ ○ ○ ○ ○	A B C D	A B C D	149 ○ ○ ○ ○ ○
A B C D	60 ○ ○ ○ ○ ○	105 ○ ○ ○ ○ ○	150 ○ ○ ○ ○ ○
15 ○ ○ ○ ○ ○	61 ○ ○ ○ ○ ○	106 ○ ○ ○ ○ ○	151 ○ ○ ○ ○ ○
16 ○ ○ ○ ○ ○	62 ○ ○ ○ ○ ○	107 ○ ○ ○ ○ ○	152 ○ ○ ○ ○ ○
17 ○ ○ ○ ○ ○	63 ○ ○ ○ ○ ○	108 ○ ○ ○ ○ ○	A B C D
18 ○ ○ ○ ○ ○	64 ○ ○ ○ ○ ○	109 ○ ○ ○ ○ ○	153 ○ ○ ○ ○ ○
19 ○ ○ ○ ○ ○	A B C D	A B C D	154 ○ ○ ○ ○ ○
A B C D	65 ○ ○ ○ ○ ○	110 ○ ○ ○ ○ ○	155 ○ ○ ○ ○ ○
20 ○ ○ ○ ○ ○	66 ○ ○ ○ ○ ○	111 ○ ○ ○ ○ ○	156 ○ ○ ○ ○ ○
21 ○ ○ ○ ○ ○	67 ○ ○ ○ ○ ○	112 ○ ○ ○ ○ ○	157 ○ ○ ○ ○ ○
22 ○ ○ ○ ○ ○	68 ○ ○ ○ ○ ○	113 ○ ○ ○ ○ ○	A B C D
23 ○ ○ ○ ○ ○	69 ○ ○ ○ ○ ○	114 ○ ○ ○ ○ ○	158 ○ ○ ○ ○ ○
24 ○ ○ ○ ○ ○	A B C D	A B C D	159 ○ ○ ○ ○ ○
A B C D	70 ○ ○ ○ ○ ○	115 ○ ○ ○ ○ ○	160 ○ ○ ○ ○ ○
25 ○ ○ ○ ○ ○	71 ○ ○ ○ ○ ○	116 ○ ○ ○ ○ ○	
26 ○ ○ ○ ○ ○	72 ○ ○ ○ ○ ○	117 ○ ○ ○ ○ ○	
27 ○ ○ ○ ○ ○	73 ○ ○ ○ ○ ○	118 ○ ○ ○ ○ ○	
28 ○ ○ ○ ○ ○	74 ○ ○ ○ ○ ○	119 ○ ○ ○ ○ ○	
29 ○ ○ ○ ○ ○	A B C D	A B C D	
A B C D	75 ○ ○ ○ ○ ○	120 ○ ○ ○ ○ ○	
30 ○ ○ ○ ○ ○	76 ○ ○ ○ ○ ○	121 ○ ○ ○ ○ ○	
31 ○ ○ ○ ○ ○	77 ○ ○ ○ ○ ○	122 ○ ○ ○ ○ ○	
32 ○ ○ ○ ○ ○	78 ○ ○ ○ ○ ○	123 ○ ○ ○ ○ ○	
33 ○ ○ ○ ○ ○	79 ○ ○ ○ ○ ○	124 ○ ○ ○ ○ ○	
	80 ○ ○ ○ ○ ○	125 ○ ○ ○ ○ ○	

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Question 2 [40 Marks]

[CLO-4 Utilize modern mobile development tools and environments (Android Studio, Flutter) for app creation.]

Scenario: You are building a small application with two screens: HomeScreen and DetailScreen. The user enters a single message on the HomeScreen, and upon tapping a button, this message must be displayed on the DetailScreen. Use the GetX package for navigation and data handling

1. Write a code that receives data from Textfield and passes to the next screen where it is displayed on a Text widget.

[15 marks]

HomeScreen.dart

```
onPressed: () {
    Get.to(
      () => DetailScreen(),
      arguments: messageController.text,
    );
}
```

DetailScreen.dart

```
final String message = Get.arguments;
return Scaffold(
  appBar: AppBar(title: const Text('Detail Screen')),
  body: Center(
    child: Text(
      message,
      style: const TextStyle(fontSize: 20),
    ),
  ),
),
```

2. What is the use of SetState() function. Explain the difference between stateful and stateless widgets.

[5+5= 10 marks]

SetState() [5 marks]

setState() is used in **Stateful widgets** to notify Flutter that the internal state of the widget has changed. When setState() is called, Flutter **rebuilds the widget tree** for that widget so the updated data is reflected on the UI.

stateful

Maintains **mutable state**

UI can change during execution

Uses setState() to update UI

Stateless

Does **not maintain any state**

UI depends only on input parameters

Cannot change once built

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3. What is the purpose of yaml file list the items that needs to be declared or added to this file. [5 marks]

The **pubspec.yaml** file is a configuration file in Flutter/Dart projects. It defines **project metadata, dependencies, assets, and settings** required for building and running the application.

1. Project Information
2. Environment
3. Dependencies
4. Flutter SDK Reference
5. Assets
6. Fonts

Bonus Question

As you know exam marking is a lethargic process. To keep the evaluator fresh write a morally clean joke. If that made the evaluator laugh you will get 5 bonus marks.