UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY ( EXTERNAL)**

*Academic Year 2022 – 3rd Year Examination – Semester 6*

# *IT6306 – Mobile Application Development*

## *Structured Question Paper*

***(TWO HOURS)***

**To be completed by the candidate**

BIT Examination Index No: .....

**Important Instructions:**

- The duration of the paper is **2 (Two) hours**.
- The medium of instruction and questions is English.
- This paper has **4 questions** and **12 pages**.
- **Answer all questions.** All questions carry **equal** marks.
- **Write your answers** in English using the space provided **in this question paper**.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper.
  If a page is not printed, please inform the supervisor immediately.
- All kinds of electronic devices including calculators are not allowed.
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**Questions Answered**

Indicate by a cross (×), (e.g. [X]) the numbers of the questions answered.

| | Question numbers | | | | |
|---|---|---|---|---|---|
| **To be completed by the candidate by marking a cross (×).** | 1 | 2 | 3 | 4 | |
| To be completed by the examiners: | | | | | |
| | | | | | |
| | | | | | |

Index No …….

1) (a) Write the correct era of mobile devices in front of each characteristic/ feature given below.

**(04 marks)**

**ANSWER IN THIS BOX**

i) QWERTY keyboard or stylus for input:
Smart phone era

ii) General Packet Radio Service allows packet-switched data services through mobiles:
Feaature phone era
……

iii) First associated with Global System for Mobile communications:
Candy bar eara
……

iv) Introducing the use of the Internet on the phone:
Feature phone era
……

(b) Mobile Ecosystem is made up of many parts that should work seamlessly together. List down the **eight (8)** layers of **Mobile Ecosystem**.

**(08 marks)**

**ANSWER IN THIS BOX**

Services, Applications, Application frameworks, Operating systems
platforms, devices, networks, operators

(c) Explain the importance of **Android Runtime** (ART).

**(03 marks)**

**ANSWER IN THIS BOX**

Android Runtime (ART) is an application runtime environment used by the Android operating system
ART performs the translation of the application's bytecode into native instructions
Devices running Android version 5.0 (API level 21) or higher, each app runs in its own process and with its own instance of the Android Runtime (ART)
ART is written to run multiple virtual machines on low-memory devices by executing DEX files
(Similar answer)

(d) Assume you are asked with determining a suitable application development platform (e.g. iOS, Android, Windows, etc.) to develop a mobile application. Explain five (5) factors you should consider when making this decision.

**(10 marks)**

**ANSWER IN THIS BOX**

**Target Audience of the Mobile Application**
Research about the possible audience, their device preferences and key interests

**Cost involved with the development**
Need to do a proper cost estimation. There may be a significant difference in costs associated with different platforms

**Devices support you expect**
How many devices should be supported by your application?
Eg: iOS will only support a limited number of devices

**Application business model**
Determine the application's clear intent; monetization options, and the relationship between the application and users.
For example, is it for business, entertainment, charity, etc..

**Technical features**
It is important to asses how easy to implement the technical features required.
The platform chosen should support the required features easily

**Third-party integrations**
Platforms should make it easier to integrate confidentially with third-party software
(Similar valid answers will be accepted)

2) (a) What does “Mobile Design” refer to? Write your definition.

**(05 marks)**

**ANSWER IN THIS BOX**

Mobile design refers to the process of creating and optimizing the visual layout, user interface (UI), and user experience (UX) of websites, applications, and other digital content specifically for mobile devices

(b) State whether the given statements are **true (T)** or **false (F)** regarding mobile design.

**(2x5 = 10 marks)**

**ANSWER IN THIS BOX**

i) Touch and zoom are the two distinct types of navigation layouts for mobile devices.

**(…F……)**

ii) When designing for touch navigation, primary and often secondary actions should be placed at the top of the screen.

**(….F……)**

iii) Fixed layout has a set number of pixels, while fluid layout scales to the entire width of the screen regardless of device orientation.

**(….T……)**

iv) Presenting mobile design layouts as wireframes during the information architecture phase helps to focus feedback on the layout specifically and separate it from other design elements.

**(….T……)**

v) The device being used by the user influences their expectations of the mobile experience, and understanding this context helps establish the appropriate look and feel for the design.

**(….T……)**

(c) Define **Color Depth** and give four (4) standard color depths that mobile devices support.

**(05 marks)**

**ANSWER IN THIS BOX**

Color depth refers to the number of bits representing the color of a single pixel in a digital image

1 bit- 21 = 2 shades (black and white)
2 bits- 22 = 4 shades (shades of gray)
8 bits- 28 = 256 shades
10 bits- 210 = 1024 shades
12 bits- 212 = 4096 shades
24 bits- 224 = 16,777,216 shades

(d) Explain the difference between **sub-pixel** based and **pixel density** based mobile device screens.

**(05 marks)**

**ANSWER IN THIS BOX**

Pixel density is determined by dividing the width of the display area in pixels by the width of the display area in inches

Subpixels are the division of each pixel into a red, green, and blue (RGB) unit at a microscopic level, allowing for a greater level of antialiasing for each font character or glyph

3) (a) What is the importance of adding all the Strings into a **string.xml** file in Android?

**(04 marks)**

**ANSWER IN THIS BOX**

*Adding all the Strings into a strings.xml file in Android is important for several reasons. It enables easy localization and internationalization of the app, promotes consistent text management, allows for quick updates and modifications, supports separation of concerns, and enhances accessibility features. By centralizing string values in the strings.xml file, developers can maintain a more organized and efficient codebase while providing a better user experience through localized content and improved text management.*

(b) What are the four (4) **main components** of an Android Application? Briefly explain the **uses** of each component.

**(08 marks)**

**ANSWER IN THIS BOX**

*Activities: Activities represent the user interface (UI) and provide a window in which the user can interact with your app. They handle user interactions, such as button clicks or touch events, and are responsible for displaying and managing the app's UI elements. Activities can start other activities, navigate between screens, and interact with other app components.*

*Services: Services are background components that perform long-running operations or handle tasks that don't require a user interface. They run independently of activities and can continue running even when the user switches to another app. Services are commonly used for tasks like playing music in the background, downloading files, or performing network operations.*

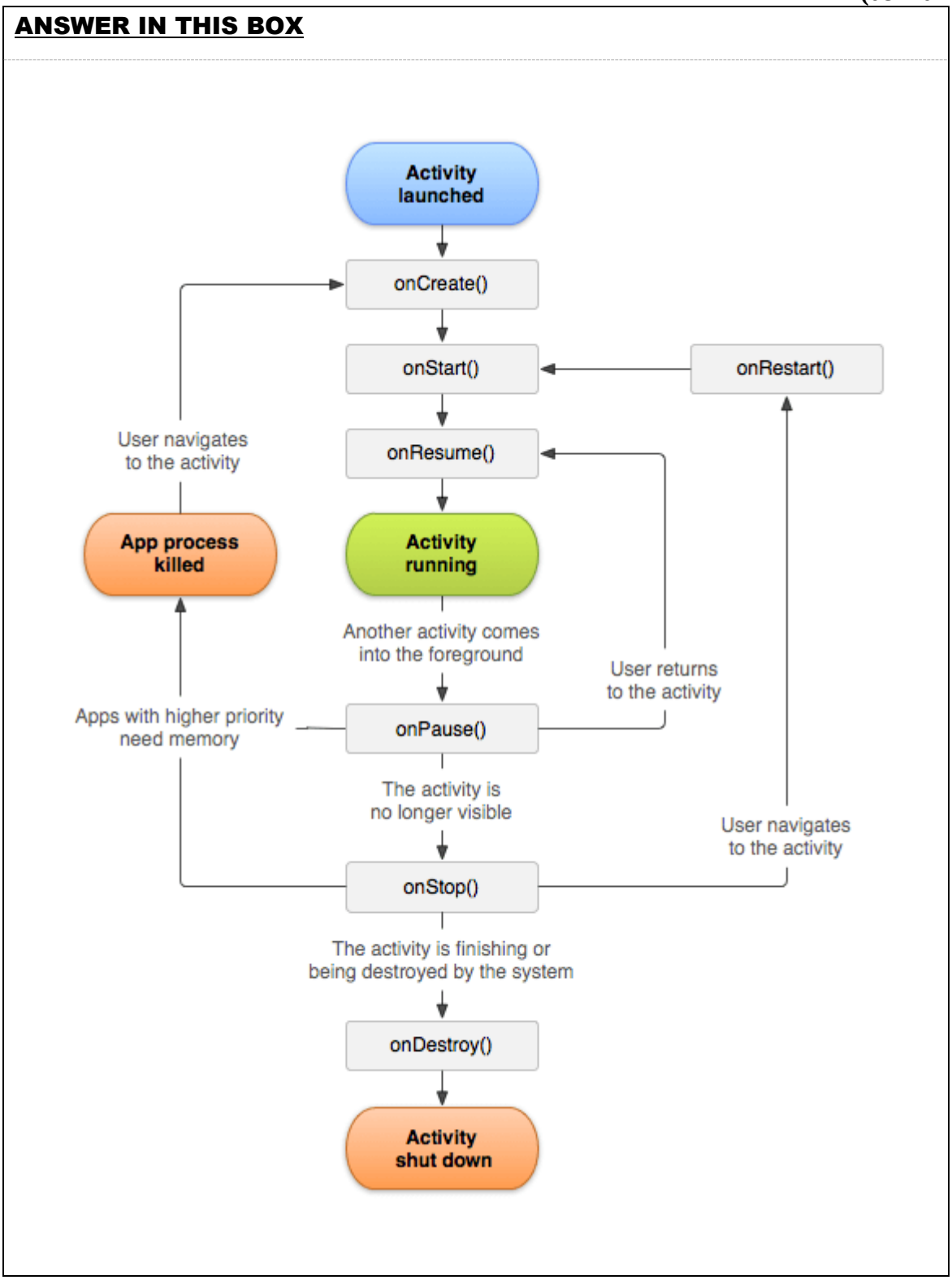
*Broadcast Receivers: Broadcast Receivers respond to system-wide events or broadcasts, such as incoming calls, SMS messages, or low battery notifications. They allow your app to receive and respond to these events even if it's not currently running. Broadcast Receivers can initiate actions or pass data to other app components based on the received broadcasts.*

*Content Providers: Content Providers manage shared data and allow different apps to access and share data with each other. They provide a standardized way of accessing data from a central repository, such as a SQLite database, file system, or online content. Content Providers offer data encapsulation, security, and the ability to control how data is shared between different apps.*

(c) Using a suitable diagram, illustrate the **main stages** of the **Android activity lifecycle** indicating **callback methods** in each stage.

**(08 marks)**

**ANSWER IN THIS BOX**



(d) Explain the functionality of the **startActivityForResult()** method by explaining the **request code**, **result code** and **data**.

**(05 marks)**

**ANSWER IN THIS BOX**

*The startActivityForResult() method in Android is used to launch an activity and expect a result back from it. It facilitates a communication flow between activities by allowing one activity to start another and receive information or data as a result.*

*When invoking startActivityForResult(), the calling activity provides a request code, which serves as a unique identifier to recognize the source of the result when the target activity finishes its operation.*

*Upon completion, the target activity sends the result back to the calling activity using the setResult() method. The result is typically represented by a result code, indicating the outcome of the target activity (such as success or cancellation), and an optional data bundle that can carry additional information related to the operation performed.*

4) (a) What is **LiveData** in Android?

**(03 marks)**

**ANSWER IN THIS BOX**

*LiveData in Android is a data holder class that allows components to observe and react to changes in data. It is lifecycle-aware, provides automatic updates, ensures data consistency, and integrates well with the ViewModel class. LiveData simplifies data observation and enables the creation of responsive and efficient Android applications.*

(b) Explain the **Restaurant Analogy** for **Android architecture components**.

**(08 marks)**

**ANSWER IN THIS BOX**

*Activity (Customer): The Activity represents the customer in the restaurant analogy. It corresponds to the user interface (UI) components in Android, such as activities or fragments, where users interact with the app.*

*ViewModel (Server): The ViewModel acts as the server in the restaurant analogy. It serves as an intermediary between the UI (Customer) and the underlying data (Chef). The ViewModel prepares and provides the necessary data to the UI, handling any transformations or operations required.*

*Repository (Chef): The Repository corresponds to the chef in the restaurant analogy. It manages the data, retrieves it from various sources, and performs operations on it. The Repository is responsible for providing the data to the ViewModel upon request.*

*Data (Food): Data represents the food in the restaurant analogy. It encompasses the information or resources used by the app, such as database records, network responses, or local files. The ViewModel requests and processes the data, while the Repository manages its retrieval and storage.*

(c) Write an **Entity declaration** in Android (Java) for the **Book** entity described below.

*"Each book has a unique ISBN that can be used to identify the book. It also consists of a title, a list of authors and a publisher".*

**(06 marks)**

**ANSWER IN THIS BOX**

```
@Entity(tableName = "books")
public class Book {
   @PrimaryKey
   public String isbn;
   public String title;
   public List<String> authors;
   public String publisher;
}
```

(d) Write a **DAO(Data Access Object) declaration** in Android (Java) for above mentioned book entity as described below.

*"DAO should allow insert, update and delete functions and it should allow retrieving all the books alphabetically ordered by the title".*

**(08 marks)**

**ANSWER IN THIS BOX**

```
@Dao
public interface BookDao {
    @Insert
    void insert(Book book);

    @Update
    void update(Book book);

    @Delete
    void delete(Book book);

    @Query("SELECT * FROM books ORDER BY title ASC")
    List<Book> getAllBooks();
}
```

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