The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Electrical and Computer Engineering

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Study Programme	: Bachelor of Software Engineering Honours
Name of the Examination	: Final Examination
Course Code and Title	**: EEI3269/EEX3269/EEI3369 Introduction to Mobile Application Development**
Academic Year	: 2020/21
Date	: 02nd January 2022
Time	: 09:30-12:30hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Five (5)** questions in **Five (5)** pages.
3. Answer **Four (4) questions** only. First question is **compulsory.** Choose **three questions** from the remaining.
4. Answers for each question should commence from a new page.
5. This is a Closed Book Test **(CBT).**
5. Answers should be in clear handwriting.

Question 1 – Compulsory [40 Marks]

The Department of Agriculture in Sri Lanka needs to build a new innovative mobile application to enlarge sustainable smart cultivation within the country. It basically aligns with the new emerging technologies such as Internet of Things (IoT) concepts (Sensor-based networks embedded with sensors, processing ability, software, cloud computing, and other latest technologies). In the preliminary discussions, stakeholders discussed the algorithms and flow charts related to the mobile application development process. As a result, you have been selected as a mobile application developer for the proposed mobile app development team. The mobile app contains the following functionalities.

Humidity sensors and pH sensors are established in the field and collecting data related to soil quality and air quality. Then upload data to the cloud storage. Mobile apps can access this data to predict the quantity of the harvest in the future. Mobile app users can remotely configure sensor configurations and status anytime and anywhere. Users are able to communicate directly with the Department of Agriculture via this app and plantation and agricultural services, advisory services, and responses are handled by the special Agriculture expert team. Farmers can directly resolve mobile app-related issues during the daytime with Customer Support Service, which is established in the Department of Agriculture. This application UI and UX are designed in a very user-friendly manner. Sinhala, English, and Tamil language support capabilities included. Application main dashboard view and app settings options are nicely designed by the implementation team.

Hardware infrastructure was implemented in the farmer's field and natural environment. Water Sprinklers were established in the plantation field. Sensors are programmed by the application development team according to the requirement specification. One of the major calculations included in the specification document is in the following manner.

Calculate Relative Humidity

The relative humidity is used for finding the water vapour content in the air.

RH (relative humidity) = (actual vapor density / saturation vapor density) ×100%

If the RH humidity <= 65% Start the Water Sprinklers in the field and switch on the alarms and notification.

Until RH humidity = 65% Water Sprinklers running.

The pH values of the plantains ranged from 4.94 to 5.37. If ph value > 5.37 generates alert messages to the agriculture officers.

a. Identify the **three functional** and **three nonfunctional** requirements for the given scenario? (6 Marks)

b. Draw the mind map for this application, considering all aspects of customers' perspectives. Write down your assumptions based on the given answer. (8 Marks)

c. Briefly explain UI and UX terms using **two** simple examples based on this scenario. (4 Marks)

d. List down **two** principles of architecture that have to be considered while building the above mobile applications. Briefly explain and justify your answer? (4 Marks)

e. Write small pseudocode for the given (Calculate Relative Humidity and start the Sprinklers) functional scenarios. Please mention all steps in the pseudocode (7 Marks)

f. Identify and list down how the application connects with other sensor (IoT) devices through the internet, synchronize and back up collected data to the cloud. (3 Marks)

g. Draw a simple diagram for this architecture. Mention all assumptions (At Least 2) and technical terms. (database type etc.) (3 Marks)

h. After implementing a mobile application for the above scenario, how could the development team optimize the implemented application based on the user experience? Evaluate your answer. (2 Marks)

i. This application is developed for Android, Mac and Windows mobile operating systems. What are the mobile application development tools that can be used to develop this mobile application? (3 Marks)

Question No 2

a. Explain **three** (3) attributes of mobile applications? (3 marks)

b. What are the key layers of the MVC framework? Briefly explain any of the two layers from your answer. (5 Marks)

c. Mobile applications and web applications are popular with the young generation. List down **three** (3) differences between Web Applications and Mobile Applications? (3 Marks)

d. List Down **three (3)** key differences of **three (3)** types of mobile app architectures? (3 Marks)

e. Discuss **two (2)** key activities mentioned below. Experience Design Process steps in your own words. (2*3=6 Marks)

   i. Usability research phase
   ii. Experience design phase
   iii. Tracking & Support

Question 3

a. Briefly explain below the basic functions of Operating Systems (OS). (6 Marks)

   i. Peripheral Device Management
   ii. Data File Management
   iii. Memory Management

b. Write down the **three (3)** layers of the Mobile Operating System and briefly explain android interfaces and applications. (5 Marks)

c. Mention **three (3)** existing Mobile Operating Systems and list down **two (2)** key features of those mobile Operating Systems. (6 Marks)

d. What is a DVM in Android application development? List down **two (2)** functions of DVM? (3 Marks)

Question 4

Digital banking and mobile banking are the most popular among people in today's society. Smart mobile banking apps, smart passbooks, smart payment methods make people's lives easier.

a. List **three (3)** security policies to be followed while developing a mobile application? (6 Marks)

b. Explain how you can apply mentioned below authentication mechanisms to any mobile application. (6 Marks)

   i) Single factor authentication

   ii) Two factor authentication

   iii) Single Sign on (SSO)

c. Write down **five (5)** mobile testing categories that can be used to test the Mobile applications? (5 Marks)

d. Below are some models of monetizing android applications. Explain any **three** of them. (3 Marks)

   (Free Distribution Model with Ads, Freemium Distribution Model, Paid Distribution Model, Affiliate Partnership Model, Commission Model)

Question 5

a. Memory resembles a human cerebrum. We can store information and instructions in it.
   i. Identify the difference between volatile and nonvolatile memory. Express your idea. (2 Marks)

   ii. Compare NOR and NAND Flash memories and write **two** differences between them? (4 Marks)

   iii. Write down the **two** merits and **two** demerits of cache memory. (2 marks)

b. The word "processor" is used interchangeably with the term "CPU". But, the CPU is not the only processor in a computer.
   i. Write down the **four** basic components of a processor and explain each of them. (4 Marks)

   ii. List down **two** examples of mobile processors. (2 Marks)

c. A sensor is a device, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a Computer processor.
   i. List down four basic specifications of a gyroscope sensor. (2 Marks)

   ii. Write four types of the accelerometer (2 Marks)

d. Describe below mobile display attributes in your own words. (2 Marks)
   i. Bi-Stability
   ii. Outdoor Reading