



Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Software Engineering

Final Examination
Year 4, Semester 1 (2023)

SE4010 – Current Trends in Software Engineering

Duration: 2 Hours

May/June 2023

Instructions to Candidates:

- ◆ This paper has 4 questions.
- ◆ Answer all questions in the booklet given.
- ◆ The total mark for the paper is 100.
- ◆ This paper contains 9 pages, including the cover page.
- ◆ Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 1**(25 Marks)**

A software development company is working on a comprehensive medical software. A team of developers are working on a prediction model where they are tasked with Classifying the possibility of a heart attack (True or False) occurring based on the data collected from the application. For this prediction a large dataset with 20,000 entries, is provided to the development team by the client. Part of the statistics for dataset can be found in the below

	Record ID	Gender	Age	Blood Type	Blood Cholesterol Level
Range	1- 20,000	Male/Female	12- 70	A+,A-,B+,B-,AB+,AB-,O+,O-	0 - 500
Type	Integer	Categorical/String	Integer	Categorical/String	Double
Missing records	0	1000	200	8000	0

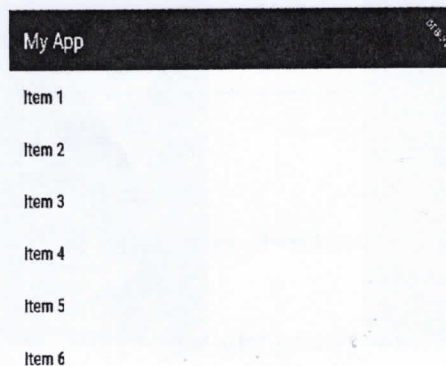
Answer the below Questions Based on the above information.

- For each Column above recommend with a valid reason, whether it should be considered for the training data or should be dropped. (5 Marks)
- For each Column above recommend with a valid reason, what will be the pre-processing techniques that needs to be used before starting the training process. (15 Marks)
- Recommend a Machine Learning algorithm that the developers can use for the prediction Model. (3 Marks)
- If the client wants to predict the probability that the patient will have a heart attack instead of classifying, what would you recommend for the Algorithm. Justify your answer. (2 Marks)

SVA

Question 2**(30 Marks)**

- a) Explain the usages of following widgets used in Flutter.
- i. Scaffold (2 marks)
 - ii. Stack (2 marks)
 - iii. Column (1 mark)
- b) Explain the following terms in Flutter.
- i. Futures (3 marks)
 - ii. Stream (2 marks)
- c) Explain the following terms in React Native.
- i. Components (2 Marks)
 - ii. Virtual DOM (1 Marks)
 - iii. JSX (1 Mark)
- d) List and describe 3 features of React Native or Flutter (6 Marks)
- e) This question has two parts, as Part (a) and Part (b). Each part contributes for 10 marks. Part (a) is based on Flutter and part (b) is based on React Native. **Please provide the answers for Part (i) or Part (ii) only.**
- i. Fill in the blanks of the given Flutter code (10 Marks)



Code:

```

void main() => runApp(const MyApp());

class MyApp extends StatelessWidget {
  const MyApp({super.key});
  @override
  Widget build(BuildContext context) {
    return const MaterialApp(
      title: 'My App',
      home: i) _____,
    );
  }
}

```

```

class HomePage extends StatefulWidget {
  const HomePage({super.key});
  @override
  _HomePageState createState() => _HomePageState();
}

```

```

class _HomePageState extends State<HomePage> {
  final List<String> items = [];
  void addItem() {
    setState(() {
      items.add('ii) _____');
    });
  }

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      appBar: AppBar(
        title: const Text('My App'),
      ),
      body: ListView.builder(
        itemCount: iii) _____,
        itemBuilder: (context, index) {
          final item = iv) _____;
          return ListTile(
            title: Text(item),
          );
        },
      ),
      floatingActionButton: FloatingActionButton(

```



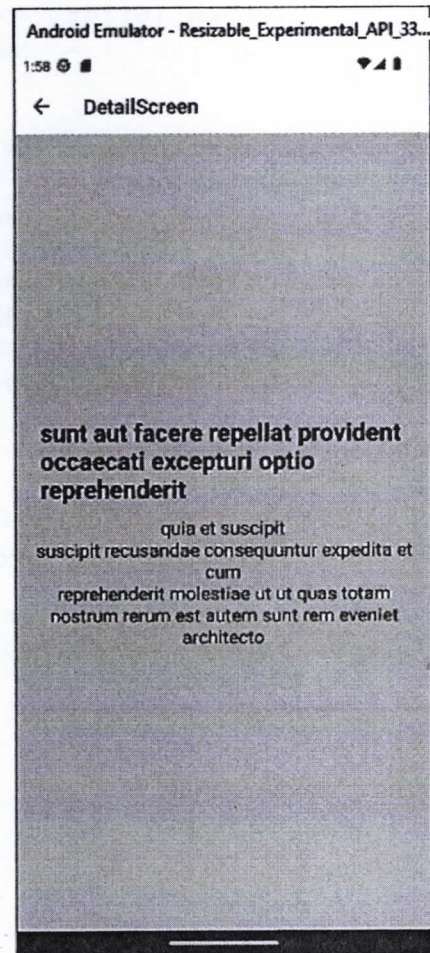
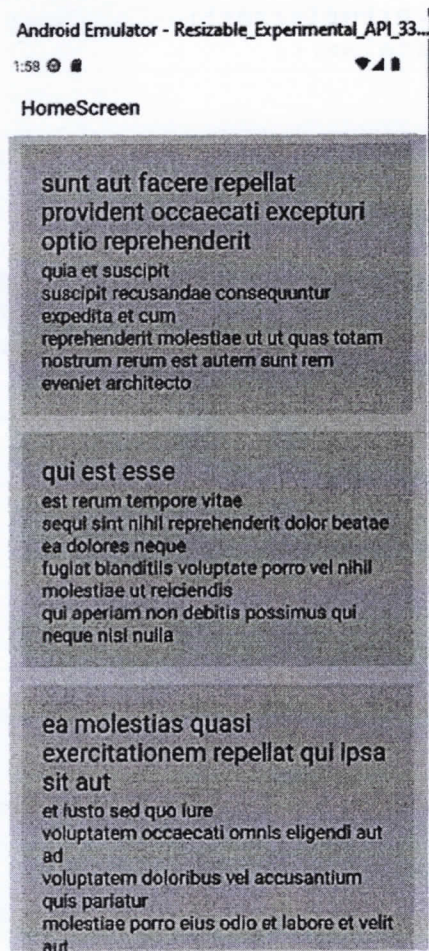
```

        onPressed: v) _____,
        child: const Icon(Icons.add),
      ),
    ),
  },
}

```

ii. Fill in the blanks of the given React Native code

(10 Marks)



HomeScreen.js

```

import React, { useState, useEffect } from 'react';
import { View, Text, FlatList, TouchableOpacity, StyleSheet }
from 'react-native';

const HomeScreen = ({ navigation }) => {
  const [data, setData] = useState([]);

  i) useEffect useEffect (() => {
    fetch('https://jsonplaceholder.typicode.com/posts')
      .then((response) => response.json())
      .then((json) => setData(json))
      .catch((error) => console.error(error))
      .finally(() => setLoading(false));
  }, []);

  const renderItem = ({ item }) => (
    <TouchableOpacity                      onPress={() =>
navigation.navigate('DetailScreen', { item })}>
      <View style={styles.item}>
        <Text style={styles.title}>{item.title}</Text>
        <Text style={styles.body}>{item.body}</Text>
      </View>
    </TouchableOpacity>
  );

  return (
    <View style={styles.container}>
      <ii) TouchableOpacity TouchableOpacity
        data={data}
        renderItem={renderItem}
        keyExtractor={(item) => item.id.toString()}
      </>
    </View>
  );
};

```

Detail Screen.js

```

import React from 'react';
import { View, Text, StyleSheet } from 'react-native';

const DetailScreen = ({ route }) => {
  const { item } = route.params;

  return (
    <View style={styles.container}>
      <Text style={styles.title}>{item.title}</Text>
      <Text style={styles.body}>{item.body}</Text>
    </View>
  );
};

```

App.js

```

import React from 'react';
import { NavigationContainer } from '@react-navigation/native';
import { createStackNavigator } from '@react-navigation/stack';
import HomeScreen from './screens/HomeScreen';
import DetailScreen from './screens/DetailScreen';

const Stack = createStackNavigator();

const App = () => {
  return (
    <iv>_____>
      <Stack.Navigator>
        <Stack.Screen name="HomeScreen" component={HomeScreen} />
        <Stack.Screen name="DetailScreen"
          component={DetailScreen} />
      </Stack.Navigator>
    </iv>_____>
  );
};

export default App;

```


Question 3**(25 Marks)**

You have been hired as a software developer by a startup that is building a new e-commerce platform. The platform is designed as a set of microservices that communicate with each other over a RESTful API. The platform is built using .NET Core and will be deployed using Docker containers in a Kubernetes cluster.

The startup has already implemented a few microservices, including an authentication service, a product catalog service, and a shopping cart service. Your task is to develop a new microservice that handles order processing. The order processing service will communicate with the shopping cart service to retrieve the customer's shopping cart, calculate the order total, and process the payment.

- a) Explain the advantages of using microservices architecture in the e-commerce platform. (3 Marks)
- b) analyze the role of Kubernetes in deploying and managing microservices in the e-commerce platform. (4 Marks)
- c) Assume that the startup has deployed the microservices in a Kubernetes cluster. Analyze how you would monitor the performance of the order processing microservice and troubleshoot any issues that arise. (6 Marks)
- d) Plan the process of developing and deploying a new microservice for order processing using the blue-green deployment.

Hint: You are to elaborate on what sort of CRUD operations you are developing and how you plan to deploy them to the docker container. (6 Marks)

- e) Write a Docker file for the order processing microservice, assuming that the microservice is built using .NET Core 3.1 and that the source code is in a folder named "OrderProcessingService". (6 Marks)

Question 4**(20 Marks)**

- a) Compare the 'Commander and Lieutenant' and 'Unforgeable Signatures' methods with respect to Byzantine Fault Tolerant systems. (8 Marks)
- b) 'EVERGREEN' is one of the world's largest shipping corporations with multiple logistic partners from all around the world. They have decided to record the GPS data of every shipment and maintain them in a block chain through the entire journey from port of origin to port of destination. Create a sample block diagram (at least 3 blocks) with the minimum components needed for a blockchain. (12 Marks)