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Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Software Engineering

Final Examination
Year 4, Semester 2 (2023)

SE4010 – Current Trends in Software Engineering

Duration: 2 Hours

November 2023

Instructions to Candidates:

- This paper will be preceded with 10 minutes of reading time. The supervisor may indicate when the answering may commence.
- This paper has 4 questions.
- Answer all questions in the booklet given.
- The total mark for the paper is 100.
- This paper contains 5 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 1

(30 Marks)

a) Explain the usages of the following widgets used in Flutter.

i) Stack overlap, edges, itself child widget.

(2 Marks)

ii) Row horizontal

(2 Marks)

iii) AppBar -

(1 Marks)

b) Explain the following terms in Flutter.

i) Chaining Futures

(3 Marks)

ii) Ephemeral state

(2 Marks)

c) Evaluate the significance of asynchronous programming in Flutter applications.

(5 Marks)

d) Assess the role of Futures in managing asynchronous tasks in Flutter.

(5 Marks)

e) Evaluate the advantages and disadvantages of using Firebase integration in a Flutter application.

(5 Marks)

f) If you were given a requirement to change the home widget of the Flutter app to a different widget, modify the MaterialApp constructor of the following code snippet.

```
class MyApp extends StatelessWidget {
      const MyApp({super.key});
      @override
      Widget build(BuildContext context) {
         return const MaterialApp(
         title: "My Future",
         home: Home(),
         );
      }
}
```

(5 Marks)

Question 2 (25 Marks)

A software development company is working on Water Quality Management software. A team of developers are working on a prediction model where they are tasked with predicting the water quality based on the data collected from the application. For this prediction a large data set with 40,000 entries is provided to the development team by the client. Part of the statistics for dataset can be found in the below.

Please Note that the Y value (Ground Truth) is a rating which is not provided in the below table

	Record ID	location	date	color	Ph Value
Range/value	1- 20,000	Location Names	dd/mm/yy	Color names	0 - 14
Type	Integer	Categorical/String	DateTime	Categorical/String	Double
Missing records	0	10000	200	5000	0

Answer the below Questions Based on the above information.

a) For each Column above recommend with a valid reason, whether it should be considered for the training data or should be dropped. (5 Marks)

b) Generally, data needs to be pre-processed before being used as inputs for model training. For the columns above suggest a pre-processing technique(if applicable) that could be used to make the training more efficient.

(15 Marks)

c) Recommend a Machine Learning algorithm that the developers can use for the prediction Model. (3 Marks)

d) If the client wants to classify the quality into Usable/Non-Usable instead of giving a quality rating, what would you recommend as the machine Learning Algorithm. Justify your answer. (2 Marks)

Question 3

(25 Marks)

You have been hired as a software developer by a startup that is building a ERP 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 HR service, and a Resource Management service. Your task is to develop a new microservice that handles Salary Management. The Salary Management service will communicate with the HR service to retrieve the employee's salary details, calculate the total salary, and process the payment.

a) Explain two benefits of using a microservices architecture in the ERP platform.

Scalability
Fault isolation

(3 Marks)

b) Analyze the role of Kubernetes in deploying and managing microservices in the ERP Platform with examples.

Orchestration (deploy -- -)
scalability
(container on demand)
Load balancer

(4 Marks)

c) Plan the process of developing and deploying a new microservice for Salary Management 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)

d) 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.

Monitoring using Performance tools - Prometh, Grafana, Prometheus
Logging - Logstash
Alerting -
Kubernetes dashboard : Creating ingress

(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 SalaryManagementservice ".

(6 Marks)

COPY */csproj */ ./
RUN public -c release -out
RUN t=&from=build
EXPOSE 80

Question 4 (20 Marks)

a) Compare the 'Commander and Lieutenant' and 'Unforgeable Signatures' methods with respect to Byzantine Fault Tolerant systems.

(8 Marks)

b) 'SHIPME' is one of the world's largest Freight Forwarding corporations with multiple logistic partners from all around the world. They have decided to record the Telemetry data of every container 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)