University of Ruhuna - Faculty of Technology

Bachelor of Information & Communication Technology Honours Degree
Level 3 (Semester II) Examination, October/November 2022
Academic Year 2020/2021
Course Unit: ICT3253 – Distributed and Cloud Computing (Written)

Answer **all four (04)** questions **Time Allowed: 2 hours**

IMPORTANT INSTRUCTIONS

- This paper contains **four (04)** questions on four (04) pages.
- The medium of this examination is **English.**
- This is a **closed-book** examination.
- Each question carries **equal 100** marks.
- You are allowed to use non-programmable calculators in this examination.

Question 01 **[100 marks]**

a) Describe the term "Distributed System". [15 marks]

b) Distinguish the main difference between parallel computing and distributed computing aid of a suitable diagram. [20 marks]

c)

(i) Write down the formula for Amdahl's law and define its parameters. [15 marks]

(ii) Suppose that a system wants to enhance the processor to improve the performance of the system. The new processor is 20 times faster in computation than the original processor. Assuming that the original processor is busy with computation 40% of the time and is waiting 60% of the time. Apply Amdahl's law to calculate the overall speedup gained by the enhancement. [20 marks]

d) Scientific research and development (R & D) based organizations want to improve their performance because now they need a very large amount of processing and computing power for a short period, and they want better utilization of processing power among the distributed nodes. Single processors could not be enough to perform the relevant tasks of each branch of the organization. Therefore higher management of the organization decided to move to the new distributed computing system model.

(i) Choose a suitable Distributed Computing System Model for the above-mentioned organization.

[10 marks]

(ii) Justify your answer for the above part (i) while highlighting three (03) characteristics of the relevant selected distributed computing system model.

[20 marks]

Question 02 **[100 marks]**

a) Mutual exclusion is a concurrency control property which is introduced to prevent race conditions.

(i) Write down the difference between mutual exclusion in the single computer system and distributed system.

[10 marks]

(ii) Briefly explain two (02) requirements of the Mutual exclusion Algorithm.

[10 marks]

b) In distributed systems, it is hard to detect, avoid, and prevent deadlock conditions. In distributed deadlock avoidance, transaction location and transaction control issues need to be addressed because different conflicts may occur due to the distributed nature of the transactions. Consider the following scenario for answering parts (i), (ii), and (iii).

"Assume that there are three (03) transactions T1, T2, and T3. Transaction T1 is waiting for data item X which is locked by T3. T3 is waiting for data item Y which is locked by T2 and T2 is waiting for data item Z which is locked by T1".

(i) Draw a Wait-For Graph for the above-given scenario. [18 marks]

(ii) Does it creates a deadlock situation? Justify your answer. [10 marks]

(iii) There are two algorithms namely wait-die and wound-wait to handle this situation. Apply wait-die and wound-wait algorithms for Transactions T1 and T2.

[12 marks]

c) Service-Oriented Architecture (SOA) is a design pattern that is designed to build distributed systems that deliver services to other applications through the protocol. Briefly discuss two (02) service categories of SOA.

[10 marks]

d) Web services provide a common platform that allows multiple applications built on various programming languages to have the ability to communicate with each other.

(i) Write down two (02) advantages and two (02) disadvantages of Simple Object Access Protocol (SOAP).

[08 marks]

(ii) REST server simply provides access to resources and the REST client accesses and modifies the resources. Briefly discuss two (02) characteristics of the proper resource representation.

[10 marks]

(iii) Briefly describe four (04) HTTP methods which are commonly used in REST-based architecture.

[12 marks]

Question 03 **[100 marks]**

a) A distributed database is a single logical database, which is installed on a set of computers that are geographically located at different locations and linked through a data communication network.

(i) Consider the following given scenario. Choose a type of fragmentation method which can be used to meet the requirements of the Marketing department of the company. Prepare a justification with two (02) factors for your answer.

"A company database keeps records of all products in a Product table having the following schema. The marketing department of the company wants to buy and reselling price details of all the products along with the Product ID (P_ID) to create promotions for them. In this case, the database designer decided to perform one type of fragmentation method to meet the requirements of the Marketing department."

Product

P_ID (Primary key)	P_name	Buying_price	Reselling_price	Quantity

[25 marks]

(ii) Replication is the mechanism of storing separate copies of the database instance to create the distributed database environment. Write down three (03) replication schemas and briefly explain two (02) of them.

[15 marks]

b) Socket programming is a way of connecting two nodes on a network to communicate with each other. It can be two types as Connection-oriented and Connection-less. Briefly discuss them with aid of a suitable real-world example.

[20 marks]

c) Consider the following given Uniform Resource Locator (URL).

"https://www.tutorialspoint.com/html/understanding_url_tutorial.htm"

(i) Identify and write down the following parts of the above-given URL.

A. Host name
B. Domain name
C. Sub-domain name
D. Service protocol [08 marks]

(ii) Write down the main two types of URLs and briefly explain them aid of a suitable example.

[12 marks]

d) A remote procedure call (RPC) is an inter-process communication technique which allows a computer program to cause a procedure or subroutine to execute in another address space. Sketch a suitable diagram to illustrate the RPC process step by step.

[20 marks]

Question 04 [100 marks]

a) In your own words explain what is Cloud Computing? [20 marks]

b) Distinguish between Traditional computing and Cloud computing.

[20 marks]

c) Write down and explain three (03) advantages and two (02) disadvantages of the public deployment model.

[30 marks]

d) "Although cloud computing has many benefits, including affordability and usability, there are also significant security considerations that must be taken into consideration before transferring sensitive applications and data to shared and public cloud infrastructures.". Do you agree with this statement? Provide your answer considering four (04) risk factors.

[30 marks]

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