



MACHAKOS UNIVERSITY

University Examinations for 2022/2023

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SIT 374: DISTRIBUTED SYSTEMS

DATE: 12/4/2023

TIME: 11:00 – 1:00 PM

INSTRUCTIONS:

Attempt Question One and **Any Other Two** questions in this paper

QUESTION ONE (30 MARKS) [COMPULSORY]

- a With the use of appropriate diagrams, distinguish between a distributed system and a centralized system. (6 marks)
- b. (i) Define the term **middleware**. (2 marks)
(ii) With the use of a diagram, show and explain the middleware positioning in a typical distributed system. (6 marks)
- c. (i) Define the term Distributed Operating Systems (2 marks)
(ii) Explain any **four** models of communication in distributed processing. (8 marks)
- d. (i) Define transparency (2 marks)
(ii) Give any four types of transparencies found in distributed systems. (4 marks)

QUESTION TWO (20 MARKS)

- a. Client and server are commonly used terms in distributed systems. Define each of these two terms. (2 marks)

b. Differentiate between the following:

- (i) fat vs thin clients
- (ii) stateful vs stateless servers

(4 marks)

c. Using well-illustrated diagrams, differentiate 2-tier from 3-tier client/server architectures.

Provide and justify an appropriate application area of each.

(9 marks)

d. (i) State what you understand by distributed file systems.

(2 marks)

(ii) Outline three properties of distributed file systems.

(3 marks)

QUESTION THREE (20 MARKS)

a. Describe five important design features of a distributed system.

(10 marks)

b. Describe the differences between the following:

(8 marks)

(i) Loosely coupled and Tightly coupled distributed systems.

(ii) Network operating systems and Distributed operating systems.

c. Explain binding as used in distributed systems communication.

(2 marks)

QUESTION FOUR (20 MARKS)

a. (i) Define the term transaction.

(2 marks)

(ii) Outline four properties of concurrent transactions.

(4 marks)

(iii) Describe the **lost update problem** experienced in concurrent transactions.

(6 marks)

b. Explain the meaning of the following terms as used in concurrent transactions:

(4 marks)

(i) Critical region

(ii) Race condition

c. (i) Differentiate between logical and physical clocks as used in distributed systems.

(2 marks)

(ii) Outline an algorithm used for clock synchronization in distributed system.

(2 marks)

QUESTION FIVE (20 MARKS)

- a Define parameter marshalling as used in distributed systems (2 marks)
- b. (i) State what you understand by a Remote Procedure Call (RPC). (2 marks)
 - (ii) Outline two reasons why a client may need to make a RPC. (2 marks)
 - (ii) Using a well-labeled diagram, explain the components of a RPC. (6 marks)
 - (iii) Describe the steps followed while making a RPC. (6 marks)
- c. State the main difference between a RPC and a Remote Method Invocation (RMI). (2 marks)