



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

DEPARTMENT OF INFORMATION SYSTEMS AND TECHNOLOGY

**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF BACHELOR
OF SCIENCE IN BUSINESS INFORMATION SYSTEMS**

4TH YEAR 2ND SEMESTER 2023/2024 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: ITB 2402

COURSE TITLE: DISTRIBUTED SYSTEMS

EXAM VENUE: LR 2

STREAM: BSC (BIS)

DATE: 25/04/2024

EXAM SESSION: 9.00 – 11.00 AM

TIME: 2.00 HOURS

INSTRUCTIONS:

- 1. Answer Question 1 (Compulsory) and ANY other two questions.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (30 MKS)

- a) Explain the following clients as used in distributed systems
- i) Thin client (4 marks)
 - ii) Fat client (4 marks)
- b) Hiding non-relevant properties of the system's components and structure is called transparency. Discuss any **TWO** forms of transparency in distributed systems. (4 marks)
- c) Remote Procedure Call (RPC) is a protocol that allows invoking a process on another machine by an ordinary procedure call. Describe the **FOUR** activities executed during this process. (4 marks)
- d) Remote Method Invocation (RMI) is a mechanism that allows an object residing in one system (JVM) to access/invoke an object running on another JVM. Briefly explain how RMI application works. (4 marks)
- e) Faults can occur both in processes and communication channels. The reason can be both software and hardware. Therefore, fault models are needed in order to build systems with predictable behavior in case of faults. Explain *arbitrary (Byzantine) faults* and *timing faults* as used here. (6 marks)
- f) Election algorithms choose a process from group of processors to act as a coordinator. If the coordinator process crashes due to some reasons, then a new coordinator is elected on other processor. Discuss *bully algorithm* and *ring algorithm* as used here. (4 marks)

QUESTION TWO (20 MKS)

In distributed systems, the system software runs on a loosely integrated group of cooperating processors linked by a network. Using appropriate examples, discuss the following issues that are frequently encountered during the design of these systems.

- i) Resource identification (5 marks)
- ii) Communications (5 marks)
- iii) Quality of service (5 marks)
- iv) Software architectures (5 marks)

QUESTION THREE (20 MKS)

- a) A distributed system is a collection of independent computers that appears to its users as a single coherent system. Discuss the following distributed systems architectures:
- i) Multiprocessor architectures (4 marks)
 - i) Client-server architectures (3 marks)
 - ii) Distributed object architectures (4 marks)

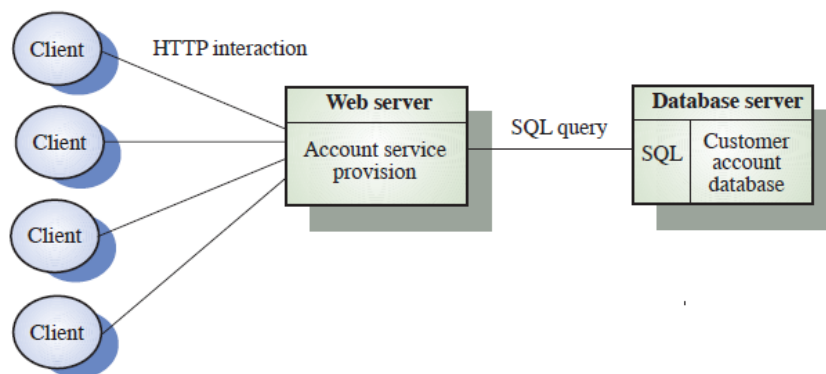
- b) Distributed file system (DFS) is a distributed implementation of the classical time-sharing model of a file system, where multiple users share files and storage resources. Describe the following as used in this respect.
- ii) Naming (2 marks)
 - iii) Multilevel mapping (4 marks)
 - iv) Transparency (3 marks)

QUESTION FOUR (20 MKS)

- a) Discuss the role of the following in the layered application architecture
- i) Presentation layer (3 marks)
 - ii) Application processing layer (3 marks)
 - iii) Data management layer (3 marks)
- b) The main goal of process management in distributed systems is to make best possible use of existing resources by providing mechanism and policies for sharing them among processors. Discuss the following approaches of process management.
- i) Process allocation (4 marks)
 - ii) Process migration (3 marks)
 - iii) Thread facilities (4 marks)

QUESTION FIVE (20 MKS)

The diagram below shows a typical internet banking system. Study it carefully and use it to answer the questions that follow.



- i) With reasons, identify the kind of architecture deployed in this system. (4 marks)
- ii) Discuss the features of the architecture in (i) above that makes it suitable for this application. (7 marks)
- iii) Discuss any other **THREE** scenarios where this architecture can be deployed. (9 marks)