MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.
Tel: +254(0) 799 529 958, +254(0) 799 529 959, +254 (0)712 524 293
Website: www.must.ac.ke Email: info@mucst.ac.ke

UNIVERSITY EXAMINATIONS 2020/2021

FOURTH YEAR FIRST SEMESTER EXAMINATIONS FOR THE BACHELOR DEGREE OF SCIENCE IN BUSINESS INFORMATION TECHNOLOGY

CCS 3351: DISTRIBUTED SYSTEMS

DATE: SEPTEMBER 2021 **TIME: 2 HOURS**

INSTRUCTIONS: Answer Question ONE and any other TWO questions.

QUESTION ONE (30 MARKS)

a) Briefly describe the following concepts as used in distributed systems.
   i. Middleware (2marks)
   ii. Process Migration (2marks)
   iii. Group communication (2marks)
   iv. Fault Tolerance (2marks)

b) Outline two design issues in the implementation of true file system for distributes system (2marks)

c) Distinguish between load balancing and load sharing (2marks)

d) Explain four advantages of a distributes system environment (4marks)

e) Outline any four reasons that justifies threading in distributed systems (4marks)

f) With the aid of a diagram, explain what is meant by **THIN** and **FAT** clients in centralized architectures (4marks)

g) With the aid of a fully labeled diagram, explain the implementation of message passing in an client server system using remote procedure call (6marks)

QUESTION TWO (20 MARKS)

a) With aid of diagrams, describe the following distributed system models stating one advantage and one disadvantage of each model;
   i. Peer-to-peer (3marks)
   ii. Client-server (3marks)

b) Inter-process communication (IPC) is an essential component of any system that allows processes to cooperate. State three characteristics of a good IPC system based on message passing (3marks)

c) Explain any five transparency features that could be useful in the design of distributed operating systems (5marks)

d) Scalability implies the ability to expand a distributed system in various dimensions. Discuss the different techniques that can be used to achieve this (6marks)

QUESTION THREE (20 MARKS)

a) Using a diagram, outline the difference between two tier and three tier client server systems (4marks)

b) Distinguish between Omission and Response failure models (4marks)

c) Process migration and file replication are two activities associated with distributed systems. What do they entail and how are the problems associated with them solved? (4marks)

d) Explain the term to live (TTL) with respect to transmitted message in a distributed system. What role does it serve in a distributed network? (3marks)

e) Individual computers and servers in distributed systems incorporate a physical clock for timing and sequencing purposes. How are the individual clocks synchronized to serve the function of a single distributed system? (5marks)

QUESTION FOUR (20 MARKS)

a) Differentiate between synchronous communication and Asynchronous communication (4marks)

b) Distributed systems are termed as loosely coupled or tightly coupled. Explain which of the two is best suited for a distributed system and why. (5mark)

c) The sketch diagram in Fig 1 illustrates communication between different remote machines in a distributed system. Explain the implementation of a distributed operating system from kernels of individual communicating machines (6marks)
No figure

QUESTION FIVE (20 MARKS)

a) Distinguish between Remote Procedure Call (RPC) and Remote Method Invocation (RMI) (2marks)

b) With the aid of a diagram, briefly explain the four most important architectural styles in distributed systems (4marks)

c) Describe any two examples of distributed systems in the real world (4marks)

d) What is coordinated Universal Time (UTC)? Give an account of how UTC is used in distributed system to synchronize clocks (5marks)

e) Define the term deadlock as applied to a distributed system and explain any three conditions that may result to the occurrence of deadlocks in distributed systems (5marks)