



*(Knowledge for Development)*

## **KIBABII UNIVERSITY COLLEGE**

**A CONSTITUENT COLLEGE OF**

**MASINDE MULIRO UNIVERSITY OF**

**SCIENCE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS**

**2014/2015 ACADEMIC YEAR**

**FOURTH YEAR SECOND SEMESTER**

**MAIN EXAMINATION**

**FOR THE DEGREE OF BSC INFORMATION TECHNOLOGY**

**COURSE CODE: CSC 413**

**COURSE TITLE: DISTRIBUTED SYSTEMS**

**DATE: 27<sup>TH</sup> APRIL, 2015**

**TIME: 8.00AM-10.00AM**

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### **INSTRUCTIONS TO CANDIDATES**

Answer Question One in Section A and Any other **TWO** (2) Questions in Section B

**TIME: 2 Hours**

## QUESTION ONE

- (a) When we say that two components of a distributed system are communicating with each other we mean that two processes, one running on each computer are in communication with each other. A distributed operating system needs to provide IPC (inter-process communication) mechanism to facilitate such communications. IPC basically requires information sharing among two or more processes. With the aid of diagrams , explain the two basic methods for information sharing. (8 marks)
- (b) Explain the concepts to improve fault tolerance ability of a distributed operating system. (4 marks)
- (c) Explain any FOUR distributed computer environment (DCE) components. (2 marks)
- (d) Explain why distributed computing systems are gaining popularity. (10 marks)
- (e) Operating systems used for distributed systems are classified as network and distributed operating system and have features which differentiate them. State and briefly explain these three features. (6 marks)

## QUESTION TWO

- (a) A central issue in the communication structure in distributed systems is the synchronization imposed on the communicating processes by the communicating primitives. The semantics used for synchronization may be broadly classified into two. Explain the two semantics. (8 marks)
- (b) Explain the difference between stateful servers and stateless servers as used in server management in distributed systems. (2 marks)
- (c) Explain the following terms as applied in distributed systems.
  - (i) Fault tolerance
  - (ii) Fault avoidance (4 marks)
- (d) Compare secret key encryption with public key encryption. Give two advantages of secret key over public key encryption and two advantages of public key over secret key encryption. Can a protocol use both secret and public key encryptions to have the advantages of both in distributed systems? (6 marks)

## QUESTION THREE

- (a) Explain the following terms
  - (i) Distributed computing systems
  - (ii) Synchronization
  - (iii) Packet
  - (iv) Thread (8 marks)
- (b) Explain what is meant by a scalable system. (3 marks)

- (c) Processes in distributed systems are often divided into two groups: clients and servers.
- (i) Describe the client- server model. (3 marks)
  - (ii) Give a graphical representation of the request-reply interaction between client and server. (3marks)
- (d) What do client and server stubs do for Remote Procedure Call (RPC). (3 Marks)

#### **QUESTION FOUR**

- (a) What is an election algorithm? (2 marks)
- (b) Briefly explain how the following election algorithms work.
  - (i) Bully algorithm
  - (ii) Ring algorithm (8 marks)
- (c) What is the purpose of naming in distributed systems? ( 2 marks)
- (d) Explain any three desirable features of a naming system. (8 marks)

#### **QUESTION FIVE**

- (a) Transparency is one of the main goals of distributed operating systems, thus it makes the existence of multiple computers invisible and provide a single image to its users. Explain any FIVE forms of transparency. (10 marks)
- (b) State and explain the methods by which the receiving process knows that the message has been received in a non-blocking receive primitive. (4 marks)
- (c) With the aid of a diagram explain the 4-message reliable IPC protocol for client-server communication between two processes. 4 marks)
- (d) Explain the difference between stateful servers and stateless servers as used in server management in distributed systems. (2 marks)