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 COMPUTER SECURITY & FORENSIC

2nd YEAR 2nd SEMESTER 2022/2023 ACADEMIC YEAR

MAIN CAMPUS

COURSE CODE: **ICB 1206**

COURSE TITLE: **SYSTEMS PROGRAMMING**

EXAM VENUE: **STREAM: BSC COMPUTER SECURITY & FORENSIC**

DATE: **EXAM SESSION:**
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) Discuss the following terms as used in systems programming

i) Backbones (2 mks)

ii) Clock synchronization (3 mks)

iii) Dynamic network (3 mks)

iv) Socket (2 mks)

b) Describe any **FIVE** scenarios that may prompt the usage of distributed algorithms at the application layer. (5 mks)

c) In virtualization, multiple operating system instances run concurrently within virtual machines on a single computer, dynamically partitioning and sharing the available physical resources such as CPU, storage, memory and I/O devices. Discuss any **FIVE** applications of virtualization concept. (5 mks)

d) In distributed systems, transaction may access data at several sites. Explain the roles of the following entities in this environment.

i) Transaction manager (3 mks)

ii) Transaction coordinator (3 mks)

e) Discuss any FOUR types of failures that are unique to distributed systems. (4 mks)

QUESTION TWO (20 MKS)

The popularity of the TCP/IP protocols did not grow rapidly just because the protocols were there, or because connecting to the Internet mandated their use. They met an important need (worldwide data communication) at the right time, and they had several important features that allowed them to meet this need. Discuss the following features as used in this respect.

i) Open protocol standards (5 mks)
ii) Independence from specific physical network hardware (5 mks)
iii) A common addressing scheme (5 mks)
iv) Standardized high-level protocols (5 mks)

QUESTION THREE (20 MKS)

a) To identify a host on the Internet, each host is assigned an address, the IP address, or in some cases, the Internet address. When the host is attached to more than one network, it is called multi-homed and has one IP address for each network interface. Discuss the various class-based IP addresses (10 mks)

b) The DNS is organized into an upside-down tree structure, with a "root" on which the different "branches" depend. Discuss the following attacks that are frequently specifically directed at the DNS

i) DNS cache poisoning (4 mks)

ii) Denial of service (DoS) (3 mks)
iii) Reflected attacks (3 mks)

QUESTION FOUR (20 MKS)

a) With the help of well labeled diagrams, discuss the following networks architectures
   i) Peer to peer (4 mks)
   ii) Client –server (4 mks)
b) Discuss the demerits of the network architectures in (a) above (8 mks)
c) Give examples of the operating systems for implementing network architectures in (a) above (4 mks)

QUESTION FIVE (20 MKS)

ACID properties for distributed database describe a set of characteristics that guarantee the reliability of database transactions. Using relevant examples, discuss how the following ACID properties can be implemented in distributed systems.

i) Atomicity (5mks)
ii) Consistency (5mks)
iii) Isolation (5mks)
iv) Durability (5mks)