(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR ONE SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF
MASTER OF SCIENCE IN COMPUTER SCIENCE

COURSE CODE : MCS 812

COURSE TITLE : COMPUTER NETWORKS & SERVICES MANAGEMENT

DATE: 30/9/2022 **TIME: 09.00 A.M – 12.00 A.M**

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE [20 MARKS]

a) Differentiate between the following term as used in network administration and system administration

i. Static and dynamic routing **[2 marks]**

ii. Subnetting and Supernetting **[2 marks]**

b) Discuss the type of network/hardware device and implementation scenarios you would most likely prefer to use or not to use for each of the following tasks:

i) Linking a LAN in a building to another LAN in the next building so that data frames can be selectively be forwarded from one LAN to another. **[4 marks]**

ii) Linking a LAN in a building to another LAN in a building situated at the other side of a field so that a number of data frames can be exchanged between the LANs. **[4 marks]**

c) Discuss the four top-most principles that guide network and system administrators in the execution of their functions. **[8 marks]**

QUESTION TWO [20 MARKS]

a) Differentiate between X.25 and frame relay networks **[2 marks]**

b) Discuss the routing algorithms used to build and maintain the IP routing table on network devices. **[7 marks]**

c) The growth in the size and complexity of networks in recent years has necessitated the development of more robust routing algorithms. These algorithms address the shortcoming observed in the earlier protocols. Part of the development was to use the principle of a *link state* to determine network topology. Discuss the process used by link state algorithms to determine network topology in a network. **[7 marks]**

d) Explain the two enhancements to the basic distance vector algorithm that can minimize the counting to infinity problem. **[4 marks]**

QUESTION THREE [20 MARKS]

a) Consider two clusters A and B each hosting multiple applications. All applications send bursty traffic between A and B over a link E. Under what conditions is the Multi-Tier Architecture implementation considered more efficient to use and what disadvantages does this implementation experience. **[5 marks]**

b) Routing algorithms can be either link-state or distance-vector. Discuss each of these two terms, highlighting the trade-offs between them. **[8 marks]**

c) You are required to design a topology discovery protocol for a network of switching nodes interconnected by links. There are n nodes, l links, the maximum degree of any node is k and there is a path between any two nodes of not more than d hops. All links are bi-directional. Each node has a unique identifier of four bytes which it knows. Describe a protocol for a node to learn about its immediate neighbours. You should specify the format of your messages and the size of any message fields. **[7 marks]**

QUESTION FOUR [20 MARKS]

a) The operating system consists of various built-in, command-line networking utilities that are used for network troubleshooting and management. Explain six (6) of these networking Commands. **[3 marks]**

b) Discuss the general security measures undertaken by a network administrator to secure a network. **[6 marks]**

c) A Network must be able to meet Three (3) important criteria necessary to be useable in real world situation for effectiveness and efficiency. Discuss. **[3 marks]**

d) Using a suitable diagram analyze the layers of the OSI model and how the TCP/IP stack maps onto this model. **[8 marks]**

QUESTION FIVE [20 MARKS]

a) The delay defines how long it takes for an entire message to completely arrive at the destination from the time the first bit is sent out from the source. Explain how the following components contribute to delay.

i. Propagation Time **[2 marks]**

ii. Transmission Time **[2 marks]**

iii. Queuing Time **[2 marks]**

b) As a network engineer/architect/administrator you shall often interact with these terminologies: Network reliability, Quality of Service, and Quality of Experience. Discuss. **[6 marks]**

c) Consider in a network environment Kenya and Uganda are neighbours. Each has wireless IPv4 routers with integrated NAT. Each neighbour connects their laptop to their own wireless router, and each uses appropriate utilities to examine the IP address of each laptop. As a network architect can path detection tools be used to measure RTT to a specific hop? **[4 marks]**

d) In traceroute, how does the sending host determine not to send any further packets with increasing TTL? **[4 marks]**