



(Knowledge for Development)

KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS
YEAR FOUR SEMESTER TWO EXAMINATIONS**

**FOR THE DEGREE OF
(COMPUTER SCIENCE)**

COURSE CODE : CSC 474E

COURSE TITLE : NETWORK PERFORMANCE & OPTIMIZATION

DATE: 30/09/2021

TIME: 02.00 P.M – 04.00 P.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

- a) Explain the following network performance characteristics.
- i. Bandwidth [2 marks]
 - ii. Throughput [2 marks]
 - iii. Latency [2 marks]
 - iv. Jitter [2 marks]
- b) Differentiate between Network reliability and Quality of Service. [2 marks]
- c) Signals travel through transmission media, which are not perfect. The imperfection causes signal impairment. Discuss four (4) types of noise that causes impairment in transmission media. [4 marks]
- d) Can path detection tools be used to measure RTT to a specific hop? [3 marks]
- e) In traceroute, how does the sending host determine not to send any further packets with increasing TTL? [4 marks]
- f) Calculate the following with regard to network performance:
- i. A network with bandwidth of 10 Mbps can pass only an average of 24,000 frames per minute with each frame carrying an average of 10,000 bits. What is the throughput of this network? [2 marks]
 - ii. What is the propagation time if the distance between the two points is 24,000 km? Assume the propagation speed to be 2.4×10^8 m/s in cable. [2 marks]
 - iii. What are the propagation time and the transmission time for a 5.0-kbyte message (an e-mail) if the bandwidth of the network is 1 Gbps? Assume that the distance between the sender and the receiver is 24,000 km and that light travels at 2.4×10^8 m/s. [2 marks]
 - iv. What is the propagation time and the transmission time for a 10-MB (megabyte) message (an image) if the bandwidth of the network is 1 Mbps? Assume that the distance between the sender and the receiver is 24,000 km and that light travels at 2.4×10^8 m/s. [3 marks]

QUESTION TWO [20 MARKS]

- a) Discuss the following terminologies as used in network monitoring.
- i. Hop [2 marks]
 - ii. Timestamp [2 marks]
 - iii. Clock Synchronization [2 marks]
- b) Differentiate between active monitoring and passive monitoring. [3 marks]
- c) As a network Engineer, discuss atleast Two (2 each) network measurement tools that could be used to measure Latency, Loss Rate, Path Detection, and Bandwidth. [8 marks]
- d) Suppose you modify your web browser to obtain pcap timestamps of HTTP requests and response. Is this an example of active or passive monitoring? Which network characteristic you can measure by using this approach? [3 marks]

QUESTION THREE [20 MARKS]

- a) What is an autonomous system (AS)? [2 marks]
- b) Differentiate between the following
- i Broadcast and Non-broadcast networks [2 marks]
 - ii X.25 and frame relay networks [2 marks]
- c) Discuss the routing algorithms used to build and maintain the IP routing table on network devices. [7 marks]
- d) 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. Explain the process used by link state algorithms to determine network topology in a network. [5 marks]
- e) Identify the two enhancements to the basic distance vector algorithm that can minimize the counting to infinity problem. [2 marks]

QUESTION FOUR [20 MARKS]

- a) Differentiate between Server Message Block (SMB) and Common Internet File System (CIFS) [3 marks]
- b) Discuss the ways through which the Server Message Block protocol can run on top of the Session and network layers. [5 marks]
- c) Discuss the Three (3) types of opportunistic locks in SMB [6 marks]
- d) During the implementation of SMB, several Performance issues are considered. Explain this statement in line with Microsoft products. [6 marks]

QUESTION FIVE [20 MARKS]

- a) Identify the three main types of problems that can be handled by the classical optimization techniques. [3 marks]
- b) Discuss the following numerical methods of optimization
 - i. Linear programming [2 marks]
 - ii. Integer programming [2 marks]
 - iii. Quadratic programming [2 marks]
 - iv. Nonlinear programming [2 marks]
- c) Discuss the ant colony optimization algorithm. [7 marks]
- d) What is the advantage of ant colony algorithm over simulated annealing and genetic algorithm approaches when the graph may change dynamically? [2 marks]