



MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

FACULTY OF ENGINEERING, APPLIED SCIENCE AND TECHNOLOGY

DEPARTMENT: COMPUTER SCIENCE AND INFORMATION SYSTEMS

DATA COMMUNICATIONS AND COMPUTER NETWORKS

CODE: BCOS 221

SESSIONAL EXAMINATIONS
DECEMBER-2023

DURATION: 3 HOURS

EXAMINER: RANGANAI N

INSTRUCTIONS

1. Answer any **FOUR** questions
2. Each question carries 25 marks
3. Total marks 100

Question 1

- a) Define the term "bandwidth" in the context of data communication. How is it different from data transfer rate? [5marks]
- b) Describe the transmission modes under the following heading.
 - i. Asynchronous transmission [3marks]
 - ii. Bit Synchronization [3marks]
 - iii. Character synchronization [3marks]
 - iv. Synchronous transmission [3marks]
- c) For 4 marks each describe the following delays associated with networks
 - i. Propagation delay [2marks]
 - ii. Transmission delay [2marks]
 - iii. Processing delay [2marks]
 - iv. Queuing delay [2marks]

Question 2

- a) Explain IPv4 and IPv6 addressing mechanisms [10 marks]
- b) What is the purpose of a subnet mask in IP addressing? How does it determine the network and host portions of an IP address? [10marks]
- c) Explain CSMA/CD and CSMA/CA protocols used in LANs discuss its advantages and limitation [5 marks]

Question 3

- a) Outline amplitude shift keying and frequency shift keying as they are used in digital to analog conversion [8marks]
- b) Explain line coding with reference to examples [1marks]

c) Given 101011100 differentiate diagrammatically the unipolar NRZ and polar NRZ. State merits and demerits of each. [10marks]

d) Using examples explain the following causes of signal impairments

Attenuation [2marks]

Distortion [2marks]

Noise [2marks]

Question 4

a) Explain the differences between circuit switching and packet switching. Discuss the advantages and disadvantages of each switching technique and provide real-world examples of their applications. [10marks]

b) Describe the process of establishing a TCP connection and the three-way handshake mechanism. Discuss the reliability features provided by TCP, such as flow control and congestion control. Provide examples of applications that use TCP as the transport protocol. [8marks]

c) explain the difference between OSI and TCP/IP protocol [7marks]

Question 5

a) Describe and draw the physical instruction characteristics of the following transmission media

i. Twisted pair

ii. Coaxial cable

iii. fiber optic [12marks]

b) A network has a transmission delay of 2 milliseconds per kilometer and a propagation speed of 200,000 km/s. Calculate the total end-to-end delay for transmitting a 10 MB file over a 500 km distance. [4marks]

c) Discuss the main differences between a hub, a switch, and a router in terms of their functions and how they handle network traffic. [9marks]

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