LAIKIPIA UNIVERSITY

UNIVERSITY EXAMINATIONS

1ST SEMESTER 2022/2023 ACADEMIC YEAR

SECOND YEAR EXAMINATION FOR THE DEGREE BACHELOR OF SCIENCE (COMPUTER SCIENCE)

COMP 216: INTRODUCTIONTO DATE COMMUNICATION NETWORKS

STREAM: R ***TIME: 2 HRS***

DAY: THURS [8.30PM – 10.30PM] ***DATE: 08/12/2022***

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.

SECTION A (30 marks)

INSTRUCTIONS: - Answer ALL Questions in this section

QUESTION ONE (30 Marks)

(a) State TWO functions of networking standards and protocols (2 marks)

(b)

i). State the OSI layer that offers reliable, connection-oriented data communication services and identify the protocol responsible for this service [1 mark]

ii). Other than the service stated above state TWO other services offered by the protocol identified in b(i) above [2 mark]

(c)

i). Explain the role of access methods in a data communication system (2 marks)

ii). Explain how each of the following access methods works (4 marks)

1. CSMA/CD:
2. CSMA/CA:

(d) Describe the following error types

1. Single-bit errors: (2 marks)
2. Burst errors: (2 marks)

(e)

i.) State the role of each of the following types of addressing applied by the TCP/IP protocol suite

3. Physical Address (2 marks)
4. Logical Address (2 marks)
5. Port Address (2 marks)
6. Specific Address (2 marks)

(f) Consider a digital Signal with eight levels

i.) How many bits are required per level? (2 marks)

ii.) List the eight levels (2 marks)

iii.) Convert the data "11100100000l101001" to an eight-level digital signal (2 marks)

SECTION B (40 Marks)

Answer ANY TWO Questions in this section

QUESTION TWO (20 marks)

(a)

(i) Explain the role of pulse code modulation (PCM) in data communication (2 marks)

(ii) With aid of diagrammatic illustrations, explain all the steps involved in pulse code modulation (PCM) e.g., to convert a sound signal into the digital form (6 marks)

(b)

i) Explain the concept of multiplexing and state its significance in data communication networks (2 marks)

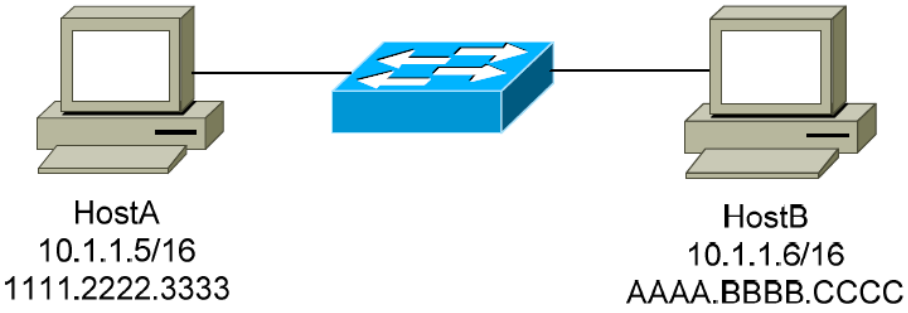
ii) Distinguish between time division multiplexing and frequency division multiplexing (2 marks)

(c) Describe the five components of a data communication system (5 marks)

(d) What is the maximum bit rate of a noiseless channel with a bandwidth of 5000 Hz transmitting a signal with two signal levels? (3 marks)

QUESTION THREE (20 marks)

(a) Study the exhibit below and answer the question that follow



Outline the steps required for Host A to communicate with Host B (5 marks)

(b) For reliable communication errors need to be detected and corrected to guard against data corruption during transmission

i) Which layers of the OSI model are error detection and correction implemented? (2 marks)

ii) Explain how vertical redundancy check works (2 marks)

(c) Distinguish an analog signal and a digital signal (2 marks)

(d) Describe the Non Return to Zero encoding technique (3 marks)

(e) Describe three functions define in the following layers of the OSI reference model

(i) Physical Layer (3 marks)

(ii) Data Link layer (3 marks)

QUESTION FOUR (20 marks)

(a) Distinguish between baseband and broadband transmission (2 marks)

(b) Describe Nyquist theorem (2 marks)

(c) Define

i) Encoding (2 marks)

ii) Multiplexing (2 marks)

iii) Modulation (2 marks)

iv) Synchronization (2 marks)

(d) An organization has a class C network 192.168.1.0 and wants to form subnets for 4 departments, with hosts as follows

A	78 hosts
B	36 hosts
C	20 hosts
D	18 hosts

(i) There are 152 hosts in all. Give a possible arrangement of network and subnet masks to make this possible. (4 marks)

(ii) Suggest what the organization might do if the department D grows to 34 hosts (4 marks)

QUESTION FIVE (20 marks)

(a)Transmission impairment of the is one of the factors that affects the data rate and transmission distance of a transmission medium

(i)Other than transmission impairment identifies and describe TWO other factors that the data rate and transmission distance of a transmission medium (2 marks)

(ii)Explain the following types of Transmission impairments

(i) Skew (2 marks)

(ii) Crosstalk (2 marks)

(iii)Attenuation (2 marks)

(iv)Noise (2 marks)

(iii)Explain the meaning of Attenuation-to-Crosstalk Ratio (ACR). Hence outline its relevance in networking transmission. (2 marks)

(b)

(i) Explain the synchronization problem faced by NRZ-L (non return to zero level) encoding scheme (2 marks)

(ii) Encode the bit stream 01001110 using NRZ-L (non return to zero level) and NRZ-I (non return to zero invert) encoding schemes (3 marks)

(iii) Encode the bit stream 010011 using Manchester and differential Manchester encoding schemes (3 marks)