ELIZADE UNIVERSITY

ILARA-MOKIN

FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
1st **SEMESTER EXAMINATION**
2020 / 2021 **ACADEMIC SESSION**

COURSE CODE: CSC 425

COURSE TITLE: Computer Networks and Communication

COURSE LEADER: Dr. Vincent Akpan

DURATION: 2½ Hours

HOD's SIGNATURE

INSTRUCTION:

Candidates should answer any **FOUR** Questions.

Students are warned that possession of any unauthorized materials in an examination is a serious assessment offence. Students are permitted to use ONLY a scientific calculator.

1. (a) Define the following terms:
   (i) Signal bandwidth (ii) Channel bandwidth   (iii) Channel capacity
   (b) (i) Define the term Nyquist rate
   (ii) State the Harley's law
   (iii) State the Shannon-Hartley theorem for multi-level and multi-phase encoding techniques.
   (iv) By comparing the Shannon's capacity to the Hartley's law. State and give one reason if there is any implication between the two?
   (c) (i) A noisy telephone channel has a bandwidth of 3 kHz and a signal-to-noise ratio (SNR). Compute the maximum channel capacity.
   (ii) For a noiseless 3 kHz channel with 4 number of different quadrature phase shift keying (QPSK) signalling values, compute the maximum channel capacity.
   (iii) If the requirement is to transmit at 50 kbit/s, and a bandwidth of 10 kHz is used. Compute the minimum signal-to-noise ratio (SNR) required.

2. (a) (i) In what situation is multiplexing used?
(ii) Why are guard bands used in frequency-division multiplexing (FDM)?
(iii) Why is synchronous pulse required in time-division multiplexing (TDM)?
(iv) How is the wastage of bandwidth in TDM overcome by Statistical-TDM?
(v) What limitation of TDM is overcome by ATM and how?

(b) Using suitable diagrams, briefly discuss the following terms:
(i) Frequency-division multiplexing (FDM)
(ii) Wavelength-frequency division multiplexing (WDM)
(iii) Time-division multiplexing (TDM)
(iv) Statistical time-division multiplexing (STDM)
(v) Orthogonal frequency division multiplexing (OFDM)

3. (a) Using a suitable block diagram, briefly explain the Open System Interconnection model (OSI model).
(b) Briefly explain the function of the respective layers of the OSI model.

4. (a) Using a suitable block diagram, briefly explain the TCP/IP stack model.
(b) Using suitable diagrams where necessary, briefly explain the function of the respective layers of the TCP/IP stack model.

5. (a) (i) Can a client computer act as a server? Briefly discuss your choice of answer.
(ii) State three characteristics of a client/server computer network.
(b) Using a suitable diagram, show the how you would position a router, a bridge and a repeater between two host computers running TCP/IP protocol stack.
(c) What is internetworking?
(d) Briefly discuss the following internetworking technology terms:
(i) Voice/Data integration technologies
(ii) Quality of service networking technologies
(iii) Multiservice Access Technologies
(e) Briefly discuss the following terms:
(i) Code division multiple access (CDMA)
(ii) Collision detection and avoidance (CD/CA)
(f) Using a summary-flow block diagram, briefly carriers sense multiple access/collision avoidance (CSMA/CA) process.