RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences
Third Year - Semester II Examination – January / February 2023

COM 3401 – DATA COMMUNICATION AND NETWORKING

Time: Three (03) hours

Instructions

- Answer **ALL** questions.
- This paper contains **five** (05) questions in **three** (03) pages.

1. a) What is data transmission?

(4 marks)

b) Define the following terms in Data Transmission. Give one example for each.

i. Direct link.

ii. Simplex link.

(6 marks)

c) Differentiate between Absolute Bandwidth and Effective Bandwidth of a signal.

(4 marks)

d) A periodic composite signal with a bandwidth of 1000 Hz is composed of three sine waves. The first one has a frequency of 100 Hz with maximum amplitude of 20 V; the second one has a frequency of 500 Hz with maximum amplitude of 10 V; the third one has maximum amplitude of 5 V. Draw the frequency domain plot of the composite signal.

(6 Marks)

2. a) Briefly explain the three major types of transmission impairments.

(6 marks)

b) Define carrier signal and its role in analog transmission.

(4 marks)

c) Explain the following analog modulation techniques:

i. AM.

ii. FM.

(6 marks)

d) Draw a suitable constellation diagram for a digital modulation scheme which combines ASK and PSK to transmit 2 bits of information per time interval.

(4 marks)

3. a) Briefly explain why a pair of modems is required to transmit the digital signals over a telephone line.

(4 marks)

b) What are the differences between unshielded twisted pair and shielded twisted pair? Explain the advantages and disadvantages of each.

(6 marks)

c) How does sky wave propagation differ from ground wave propagation?

(4 marks)

d) Write short notes on each of the following:

i. Broadcast networks.

ii. Virtual private networks.

iii. Client-server networks.

(6 marks)

4. a) Explain the following with respect to layered network architecture:

i. Peers.

ii. Interfaces.

iii. Protocol stack.

(6 marks)

b) "The application layer in the Internet includes many predefined protocols to support the various user applications." List four (4) of them with their applications.

(4 marks)

c) What is the name given to the data link layer PDU? Explain the structure of it.

(5 marks)

d) Explain a suitable error detection mechanism that can be used to detect a single-bit error in a data link layer PDU.

(5 marks)

5. a) "TDM is commonly used for multiplexing digitized voice streams and data streams." Distinguish between synchronous and statistical TDM.

(4 marks)

b) Assume that 20 digital sources, each of 100 Kbps, are to be combined using synchronous TDM. Each output slot carries 1 bit from each digital source, but one extra bit is added to each frame for synchronization. Answer the following questions:

i. What is the size of an output frame in bits?

ii. What is the efficiency of the system (ratio of useful bits to the total bits)?

iii. What is the efficiency of the system if each output slot carries 2 bits from each source?

(6 marks)

c) "Reliability can be achieved by adding error control services to the transport layer." State four (4) responsibilities of transport layer error control services.

(4 marks)

d) What is classful addressing in IPv4?

(2 marks)

e) Explain how to determine the class of an address using its binary notation.

(4 marks)

--- End ---