RAJATRATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES, MIHINTALE

B.Sc. (General) Degree in Applied Sciences
Third Year - Semester I Examination - June/July 2018

COM 3401 – DATA COMMUNICATION AND NETWORKING

Time: Three (03) hours

Answer All questions.

Q1. (a) Draw the block diagram of a typical data communication model and explain its components. [8 Marks]

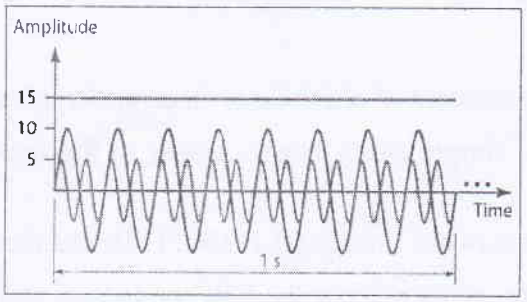
(b) Explain the following tasks in a data communication system:

i. Signal generation.

ii. Message formatting. [4 Marks]

(c) Contrast a periodic signal with an aperiodic signal. [4 Marks]

(d) Following time-domain plot shows three sine waves, each with different amplitude and frequency. Draw a frequency-domain plot for these three waves.



[4 Marks]

Q2. (a) What are three important characteristics of a periodic signal? Briefly explain them. [6 marks]

(b) Which characteristics of an analog signal are changed to represent a digital signal in each of the following digital-to-analog conversions?

i. ASK ii. FSK iii. PSK iv. QAM [4 marks]

(c) Describe the structure of optical fiber and state its advantages and disadvantages. [6 marks]

(d) How does sky propagation differ from line-of-sight propagation? [4 marks]

Q3. (a) What are the advantages of having computer networks in a business? [6 marks]

(b) Briefly explain why a pair of modems is required to transmit the digital signals over a telephone line. [4 marks]

(c) What are the three main classifications of networks based on the geographical area that a network is covered. Briefly explain each of them. [6 marks]

(d) For each of the following four networks, discuss the consequences if a connection fails.

i. Five devices arranged in a mesh topology.

ii. Five devices arranged in a star topology (not counting the hub).

iii. Five devices arranged in a bus topology.

iv. Five devices arranged in a ring topology. [4 marks]

Q4. (a) Name each of the layers in the OSI model and draw a diagram that shows the ordering of these layers. [4 marks]

(b) Match the following functions to one or more layers of the OSI model:

i. Reliable process-to-process message delivery.
ii. Defining frames.
iii. Flow control.
iv. Transmission of bit stream across physical medium. [4 marks]

(c) What are headers and trailers, and how do they get added and removed? [4 marks]

(d) What are the responsibilities of the data link layer in the TCP/IP model? [4 marks]

(e) What is the difference between a port address, a logical address, and a physical address? [4 marks]

Q5. (a) Discuss the concept of redundancy in error detection and correction. [4 marks]

(b) How is the simple parity check related to the two-dimensional parity check? [4 marks]

(c) Given the dataword (message) 1010011110 and the divisor 10111,

i. Show the generation of the CRC codeword (transmitting frame) at the sender site (using modulo-2 division).

ii. Show the checking of the codeword (receiving frame) at the receiver site (assume no error). [8 marks]

(d) What is the Hamming distance for each of the following codewords?

i. d (10000, 00000)
ii. d (10101, 10000)
iii. d (11111,11111)
iv. d (000, 000) [4 marks]

END