SOUTH EASTERN KENYA UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE, BACHELOR OF INFORMATION TECHNOLOGY AND BACHELOR OF BUSINESS INFORMATION TECHNOLOGY

SCI 106: DATA COMMUNICATION

DATE: 5TH DECEMBER, 2017   **TIME: 10.30 -12.30 PM**

INSTRUCTIONS TO CANDIDATES

- **Section A(Compulsory)**

- **Answer <u>ANY TWO</u> questions from section B**

Question One

    a. Define the following terms as used in data communication.
       i. Multiplexing
      ii. Attenuation   **(2 Marks)**

    b. Twisted pair wire is an example of a transmission media in data communication. Justify the need for twisting the wires**.**   **(1 Mark)**

    c. Highlight **four** forms of information that can be transmitted by a data communication channel**.**

                                                  (4 Marks)

    d. Suppose a signal travels through a transmission medium and its power is reduced to one-half. Calculated its attenuation.   **(2 Marks)**

    e. With an aid of a diagram, explain the **three** basic components of all signals.**(4 Marks)**

f. Define the following terms:
    i.   spectrum of a signal   **(1 Mark)**
    ii. bandwidth of a signal   **(1 Mark)**

g. Distinguish between:
    i.   data and signals   **(2 Mark)**
    ii. analog and digital signals   **(2 Mark)**

h. Sketch a chart for the following bit pattern 11010010 for the digital encoding schemes:
    a. NRZL   **(2 Mark)**
    b. Manchester   **(2 Mark)**

i. Calculate the bandwidth of a signal composed of frequencies from 50 Hz to 500 Hz.
    (1 Mark)
j. Highlight **three** factors one should consider in choosing a transmission media. **(3 Marks)**

k. Distinguish between half duplex and full duplex giving an example in each case.

                                                                                 (3 Marks)

SECTION B (40 marks)- Answer any Two Questions

Question Two

a. Describe three signal modulation techniques for converting digital data to analog signal.
                                                                                 (6 Mark)
b. With an aid of a diagram, explain three multiplexing technique stating their areas of
    application.
                                                                                 (6 Marks)
c. Compress 00001100000100011 using run-length encoding and compute the percentage
    data reduction**.**
                                                                                 (4 Marks)
d. Using an example illustrate how Longitudinal Redundancy Check can be used for error
    detection during data transmission.   **(4 Marks)**

Question Three
a. What is the decibel loss of a signal that starts at point A with a strength of 2000 watts and
    ends at point B with a strength of 400 watts.   **(2 Marks)**

b. With aid of a diagram, describe the **five** components of a data transmission model

                                                                                 (6 Marks)

c. Rank the four transmission media in order from highest lowest based on the parameters given the table below.

Media	Speed	Bandwith	Immunity To EMI
Twisted pair			
coaxial			
Fiber optic			
microwave			

(3 Marks)

d. Given a bit pattern of 00011000:

   i.   Draw in chart form the voltage representation using differential manchester digital encoding scheme. **(2 Marks)**

   ii.   Convert signal from four bits(4B) to five bits(5B) using the table below and draw its chart based on Non return to Zero Inverted. **(2 Marks)**

Valid Data Symbols	
Original 4-bit data	New 5-bit code
0000	11110
0001	01001
0010	10100
0011	10101
0100	01010
0101	01011
0110	01110
0111	01111
1000	10010
1001	10011
1010	10110
1011	10111
1100	11010
1101	11011
1110	11100
1111	11101

   iii.   Justify the effectiveness of 4B/5B as opposed to differential Manchester.
(2 Marks)

e. The signal spectrum for a telephone linenormally ranges between 300 Hzto 3300 HzGiven that its signal-to-noise ratio is 3162.Calculate the theoretical highest bit rate of the telephone line.
(3 Marks)

Question Four

a. Explain **four** sources of error during data transmission. **(4 Marks)**

b. Describe the following switched network stating one advantage of each.
  i. Circuit switched network. **(4 Marks)**
  ii. Packet switched network. **(4 Marks)**

c. To transmit analog data as a digital signal it must first be digitized. Using a diagram explain the following digitization process.
  i. Delta modulation **(4Marks)**
  ii. Pulse code modulation **(4 Marks)**