University of Barishal

Department of Computer Science & Engineering

B.Sc. 2nd Year 2nd Semester Final Examination-2023

Course Code: CSE-2205, Course Title: Data Communication

Admission Session: 2021-22

Full Marks: 60 **Time: 03 hour**

There are eight questions. Answer five of the questions. Figures in the right-hand margin indicate full marks.

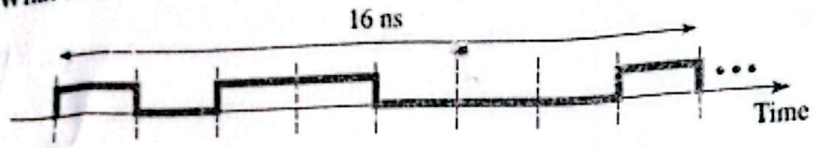
1. (a) What do you mean by data communication? Write shortly about the five main components of a data communication system. [03]

   (b) What is switching in data communication? Briefly describe the virtual circuit networks including its stages, advantages, disadvantages and real application scenarios. [06]

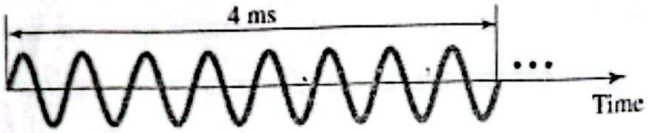
   (c) What is OSI model? Differentiate between OSI and TCP/IP model in details. [03]

2. (a) What is a composite signal? How can we decompose it into its components? Explain it briefly. [03]

   (b) What is the bit rate for the signal in following Figure? [02]



   (c) What is the frequency of the signal in following Figure? [02]

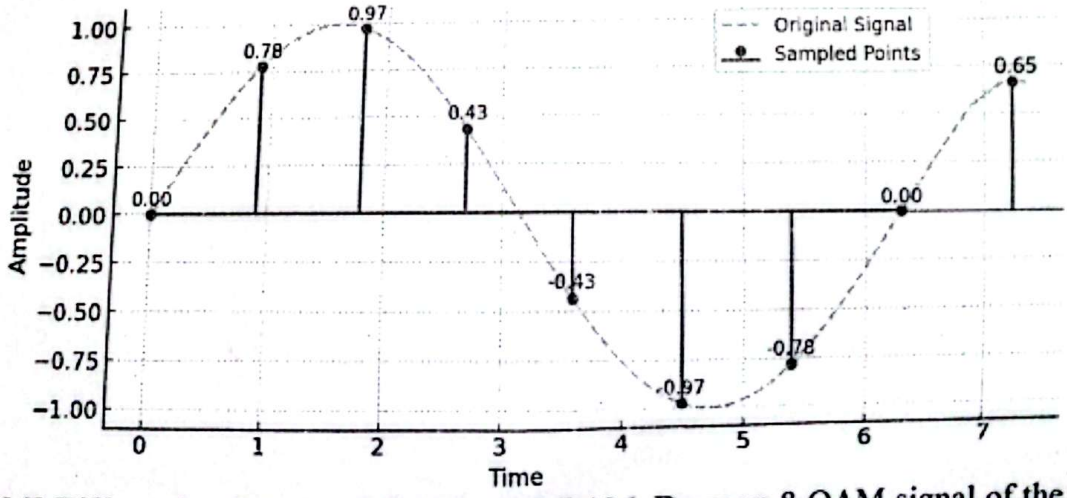


   (d) (i) What is the way to measure attenuation? [2+3]

   (ii) The loss in a cable is usually defined in decibels per kilometer (dB/km). If the signal at the beginning of a cable with −0.4 dB/km has a power of 3 mW, what is the power of the signal at 20 km?

3. (a) Why do we need to know about the following terms in data communication course? Briefly explain. [03]
   Baseline Wandering, DC components and self-synchronization.

   (b) Please do the following analog to digital (ADC) conversion process of the following sampled signal using pulse code modulation (PCM) method and find out the digital data. [05]



   (c) What is QAM? Differentiate between 4-QAM and 8-QAM. Draw an 8-QAM signal of the following bit stream- [04]
   000 001 111 100 101 010 001 110 011 101

   (a) What is line encoding scheme? [1+7]
   Draw the digital signal of the following bit stream by the following schemes: unipolar NRZ, polar NRZ-I, polar RZ, polar biphase (Manchester and differential Manchester), bipolar-AMI and pseudo-ternary and multilevel 2B1Q.
   01100111001

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(b) Mention your logic about which analog conversion technique is the most susceptible to noise. [02]
(c) What will be the problem if we don't follow the Nyquist theorem during sampling an analog signal. Explain with a proper illustration. [02]

5. (a) Explain IP spoofing and packet sniffing? [04]
(b) In a noisy channel, Selective Repeat ARQ protocol can solve the problems what other ARQ protocols (stop and Wait ARQ, Go-back-N ARQ) may face. What is that problem and how it can solve this? and explain this selective repeat ARQ protocol with a proper diagram and examples. [08]

6. (a) Why do we need to apply multiplexing technique in data communication? Mention three multiplexing techniques and differentiate them. [04]
(b) Explain briefly two-dimensional parity-check code. How many bits can be checked if there has been any error occurred or not? [02]
(c) Assume, A sender sends the data 111001011. Now, using C (13,5) and the divisor 11101, Show how the codeword is generated by CRC method. If the receiver receives the codeword 111001101, how to decide whether an error has occurred or not. [06]

111001101 1111

(a) What is Media Access Control (MAC)? How many protocols are there? Name all of them. [03]
(b) Prove that in CDMA a receiving station can get the data sent by a specific sender if it multiplies the entire data on the channel by the sender's chip code and then divides it by the number of stations. [5]
(c) Alice and Bob are experimenting with CSMA using a W_2 Walsh table (see the following Figure). Alice uses the code [+1, +1] and Bob uses the code [+1, −1]. Assume that they simultaneously send a hexadecimal digit to each other. Alice sends $(6)_{16}$ and Bob sends $(B)_{16}$. Show how they can detect what the other person has sent. [4]

$$W_1 = [+1] \quad W_{2N} = \begin{bmatrix} W_N & W_N \\ W_N & \overline{W_N} \end{bmatrix}$$

a. Two basic rules

$$W_2 = \begin{bmatrix} +1 & +1 \\ +1 & -1 \end{bmatrix} \quad W_4 = \begin{bmatrix} +1 & +1 & +1 & +1 \\ +1 & -1 & +1 & -1 \\ +1 & +1 & -1 & -1 \\ +1 & -1 & -1 & +1 \end{bmatrix}$$

b. Generation of W_2 and W_4

(a) Write short notes on the following topics: [3*4 =12]
(i) Piggybacking
(ii) Satellite communication and Categories of Satellite
(iii) WiMAX vs Wi-Fi
(iv) Cellular telephony

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