# BRAC UNIVERSITY
## Department of Computer Science and Engineering

Examination: Semester Final
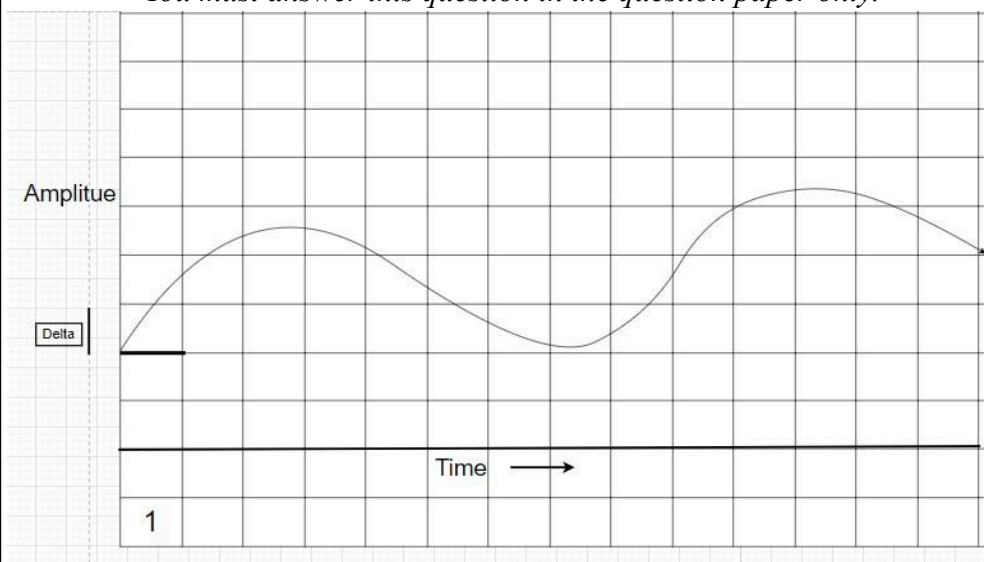Duration: 1 hr. 45 min

Semester: Summer 2023
Full Marks: 40
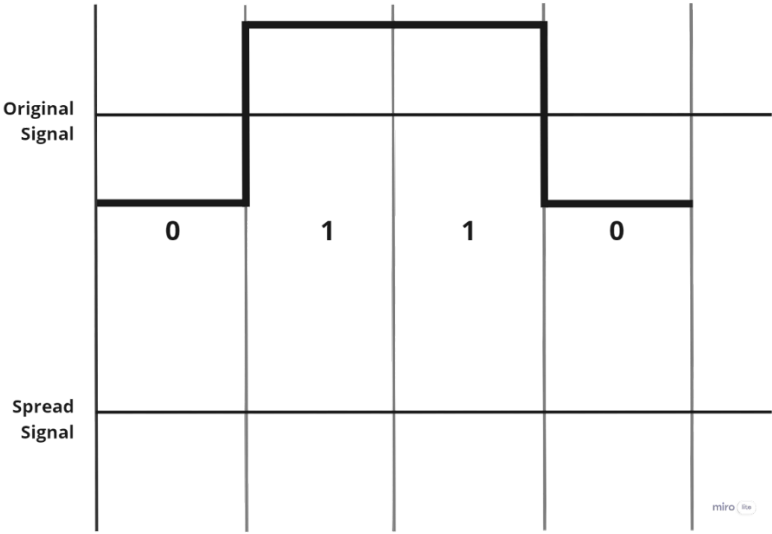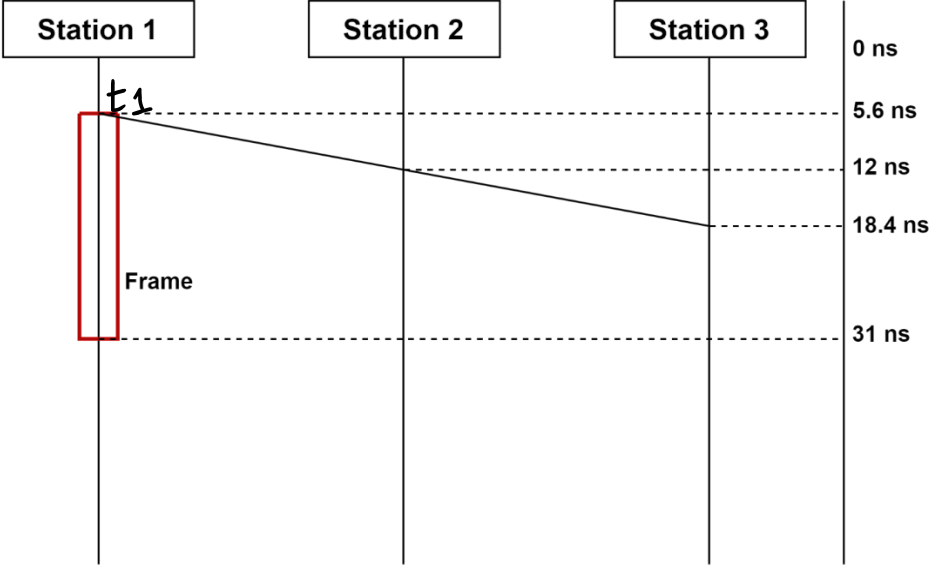
CSE 320/EEE361/ECE361: Data Communications

Answer the following questions.
Figures in the right margin indicate marks.

# SET A

| Name: | | ID: | | Section: |
|---|---|---|---|---|

| 1.<br>[CO2] | a) | **Show** the staircase in the following graph and generate the digital data from the given analog signal using the **Delta Modulation (DM)** technique.<br>*You must answer this question in the question paper only.*<br> | 5 |
|---|---|---|---|
| [CO4] | b) | What is the function of the twisting in twisted-pair cable? | 2 |
| [CO4] | c) | What is the purpose of cladding in an optical fiber? Which type of optical fiber cable is recommended for long haul communication and why it is so? | 3 |

| | | | |
|---|---|---|---|
| **2.**<br>**[CO3]** | a) | **Consider**, you have 4 sources, each creating 250 characters per second. If the interleaved unit is two characters long and 1 synchronous bit is added to each frame, find the followings:<br>i.   What is the size of a frame (in bits)?<br><br>ii.  What is the frame rate (fps)? iii. What is the input bit rate<br><br>    (in bps)? iv. What is the output data rate (in bps)?<br><br>    v. What is the output bit duration (in sec)? | 5 |
| **[CO3]** | b) | **Suppose** you have three channels among which two channels have a bandwidth of 1600 kbps and one with 1200 kbps. How would you multiplex this without using any extra pulses? Draw and validate with visual representation. | 3 |
| **[CO3]** | c) | **Differentiate** between Multiple slot multiplexing and Multilevel multiplexing. | 2 |
| **3.**<br>**[CO3]** | a) | Assume we want to send the following signal using DSSS technique. For ensuring higher security, we have invented a 5-bit spreading code "10110". Draw the corresponding spread signal on the question paper. You can use bipolar NRZ encoding (0 = negative voltage, 1 = positive voltage) for signal drawing. **Comment** on the bandwidth of the spread signal in brief.<br><br> | 5 |

| | | | |
|---|---|---|---|
| [CO5] | b) | Suppose, all the stations are transmitting following CSMA/CD protocol. Station 1 and Station 3 are at opposite ends of the common multipoint link that<br><br><br><br>all the stations share. The bandwidth of the link is 10 Gbps.<br>   i.    **Find** out the transmission time and maximum propagation time from the given diagram.<br><br>   ii.   If collision detection methods are introduced, what should be the minimum size of the frame in bytes? Does the frame in the given diagram meet the minimum size requirement? | 5 |
| 4.<br>[CO5] | a) | Consider an environment where usually most stations remain idle (no data to send), which multiple access protocol is suitable in such a scenario? **Justify.** | 2 |
| | b) | As a network administrator, you want to provide a fair bit rate or data rate (R/N) in respect to the time to each of the stations. **Mention** the name of the MAC protocol that satisfies the condition. What is the drawback of this protocol in terms of bandwidth utilization of a common channel, **validate** with a diagram. *[You can imagine any number of stations that transmit data.]* | 3 |
| | c) | Let us assume a packet is made only of four 16-bit words $(450F)_{16}$, $(1A4)_{16}$, $(A309)_{16}$, and $(B00)_{16}$. (Hint: The given words are in hexa-decimal value, that means, each digit can be represented by 4 bits. Remember hexadecimal values range from 0000 – FFFF).<br><br>   i.    **Show** the checksum at the sender.<br><br>   ii.   Synthesize a case where checksum method will fail to detect error and show how the checksum method will fail. Explain the reason of failure. | 5 |

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