

Mid Assignment

00651 DATA COMMUNICATION



American International University-Bangladesh

Submitted To

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American International University-Bangladesh (AIUB)

Faculty of Engineering

COE 3101: Data Communication

Mid Term Theory Assignment Question Paper

Instructions:

- This assignment must be submitted online as a **PDF** file on **VUES** under the component named **‘SUBMIT MID TERM THEORY ASSIGNMENT HERE’**.
- The file name must be **‘YOUR_ID MT THEORY ASSIGNMENT.pdf’**, where **ID** is your ID. For example, the file name can be **19-34567-2 MT THEORY ASSIGNMENT.pdf**
- On cover page of this assignment, **NAME**, **ID**, and **SECTION** must be mentioned clearly.
- **ID** related calculations must be presented clearly.
- You can prepare the assignment by hand or on computer.
- Total grade is **30**.
- **Plagiarism will be penalized.**
- **Deadline: 04/11/2022 (Friday) 5:00 PM.**

Question:

Assume your **ID** is **AB-CDEFG-H**. Convert each digit of **E**, **F**, and **G** into **4-bit binary** data units in that order. Convert this **12-bit** binary bit stream into digital signal using the following line coding methods. **Show your signals very clearly**. Signals without proper scaling and markers will not get any marks. Also find out **required average bandwidth (BW)** for each of these methods given the data rate (**N**) is **(E + F + G + H) kbps**. Also comment on how much these methods experience **Baseline Wandering** and **DC Component** problem, and if they provide **Auto Synchronization**.

a) Bipolar AMI

b) Polar NRZ-L

c) Polar differential Manchester

d) 2B1Q

e) MLT-3

Example bit stream and data rate:

Bit Stream: If your ID is **19-34587-2** then **E = 5 = (0 1 0 1)₂**, **F = 8 = (1 0 0 0)₂**, and **G = 7 = (0 1 1 1)₂**. So, your **24-bit** binary bit stream is: **0 1 0 1 1 0 0 0 0 1 1 1**

Data Rate: **N = (E + F + G + H) kbps = (5 + 8 + 7 + 2) kbps = 22 kbps**

My ID = 20-43737-2
= AB-CDEFGH

$$\text{So, } E = 7 = (0111)_2$$

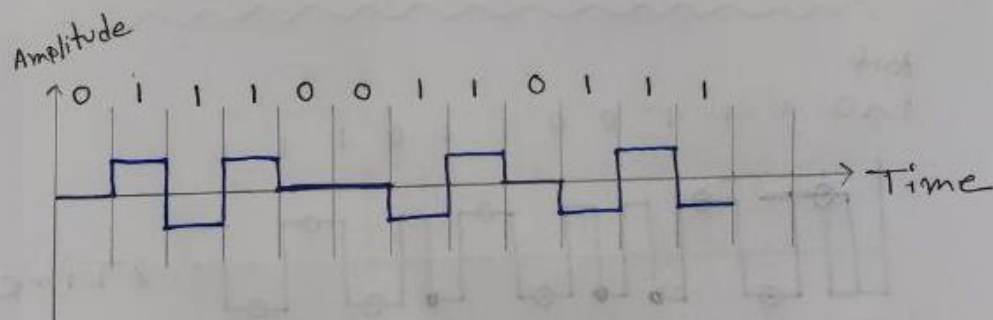
$$F = 3 = (0011)_2$$

$$G = 7 = (0111)_2$$

So, 12 bit binary stream is 011100110111

$$\text{Data rate, } N = (E + F + G + H) = (7 + 3 + 7 + 2) = 19 \text{ Kbps}$$

(a) Bipolar AMI



Here, $L = 2$

Data rate is 19 Kbps

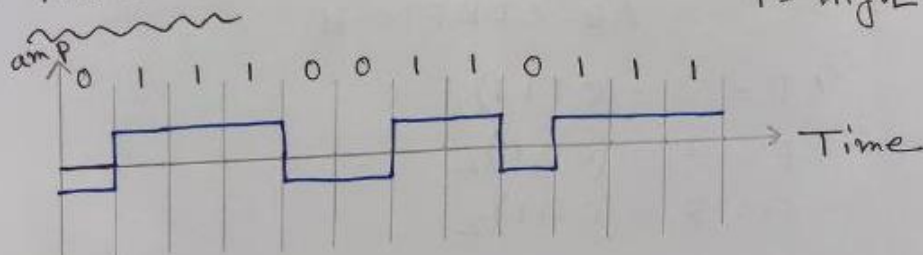
$$\therefore \text{signal rate is } \frac{19}{2} \text{ kbaud.}$$

$$= 9.5 \text{ Kbaud}$$

\therefore Minimum bandwidth is 9.5 KHz.

(b) NRZ-L

Here, 0 = Low
1 = High



Data rate

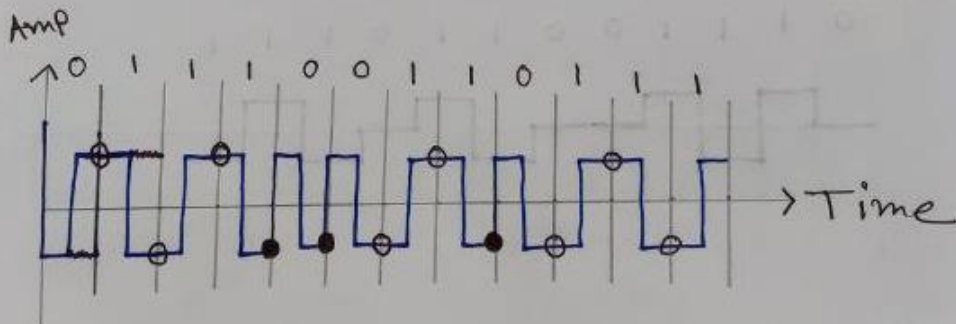
Bit rate is 19 Kbps

Signal rate is $\frac{19}{2}$ Kbaud.

$= 9.5$ Kbaud

\therefore Minimum bandwidth is 9.5 KHz.

(c) Polar Differential Manchester



Here,

Data rate

Here, Bit rate is 19 Kbps

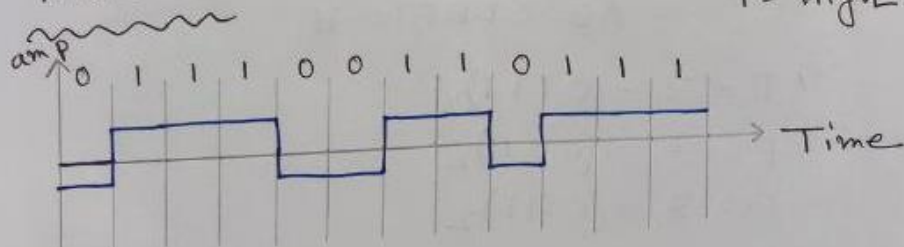
\therefore Signal rate is 19 Kbaud

\therefore Minimum bandwidth is 19 KHz.

0 NO inversion : Next bit 1

● inversion : Next bit 0

(b) NRZ-L



Data rate

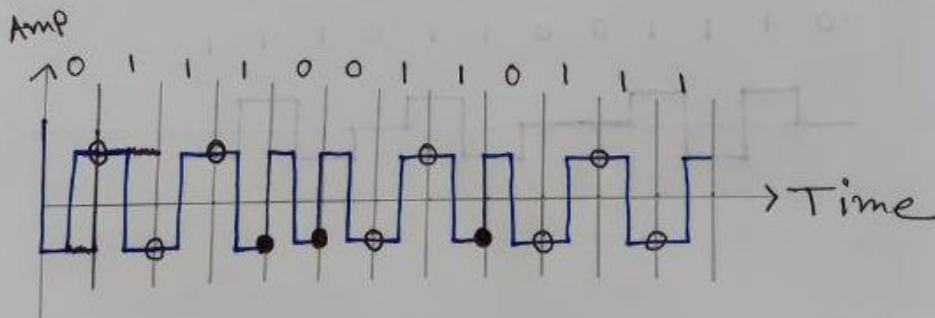
Bit rate is 19 Kbps

Signal rate is $\frac{19}{2}$ Kbaud.

$= 9.5$ Kbaud

\therefore Minimum bandwidth is 9.5 KHz.

(c) Polar Differential Manchester.



Here,

Data rate

Here, Bit rate is 19 Kbps

\therefore Signal rate is 19 Kbaud

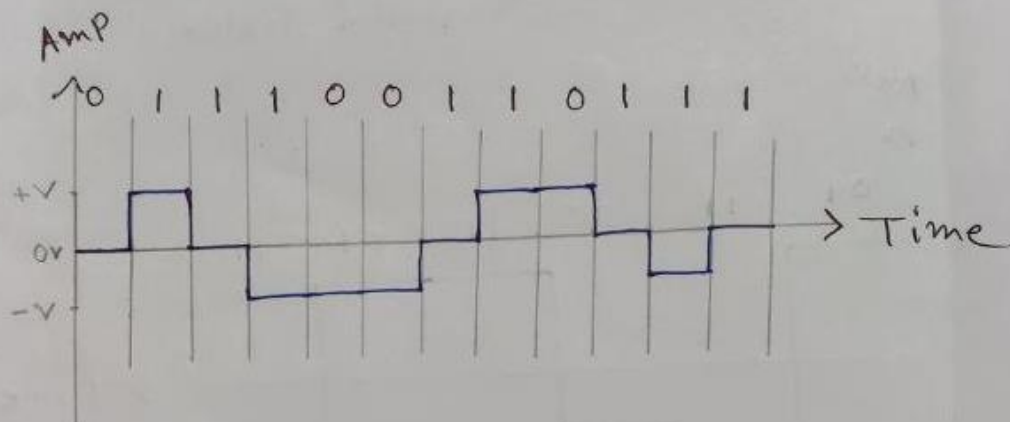
\therefore Minimum bandwidth is 19 KHz.

○ NO inversion : Next bit 1

● inversion : Next bit 0

(e) MLT-3

Assume, last level was at zero voltage.
and last non-zero level is negative.



Here,

Data rate is 19 Kbps.

\therefore signal rate is $\frac{19}{4}$ Kbaud.
 $= 4.75$ Kbaud.

\therefore Minimum band width is 4.75 KHz