Course Title: Computer Communication Network **Module:** 06

Instructor: **Total Marks:** 50

Student Details

Name: mohsin ali **Student ID:** 13746

Q1. (a) 1. An NRZ-I signal has a data rate of 100 Kbps. Using the following Figure, calculate the value of the normalized energy (P) for frequencies at 0 Hz, 50 KHz, and 100 KHz. Marks 20 CLO 1

○ No inversion: Next bit is 0 • Inversion: Next bit is 1

2. What is the Nyquist sampling rate for each of the following signals?
   a. A low-pass signal with bandwidth of 200 KHz?
   b. A band-pass signal with bandwidth of 200 KHz if the lowest frequency is 100 KHz?
3. We have sampled a low-pass signal with a bandwidth of 200 KHz using 1024 levels of quantization.
   a. Calculate the bit rate of the digitized signal.
   b. Calculate the SNRdB for this signal.
   c. Calculate the PCM bandwidth of this signal.
4. What is the maximum data rate of a channel with a bandwidth of 200 KHz if we use four levels of digital signaling.

Q2 (a) Draw the graph of the NRZ-L, NRZ-I, Manchester and differential Manchester scheme using each of the following data streams: Marks 16 CLO 1
   a. 01010101
   b. 10110011

Q3 (a) 1. A TV channel has a bandwidth of 6 MHz. If we send a digital signal using one channel, what are the data rates if we use one harmonic, three harmonics, and five harmonics? Marks 13 CLO 1
2. A signal travels from point A to point B. At point A, the signal power is 100 W. At point B, the power is 90 W. What is the attenuation in decibels?
3. The attenuation of a signal is 10 dB. What is the final signal power if it was originally 5 W?
4. A signal has passed through three cascaded amplifiers, each with a 4 dB gain. What is the total gain? How much is the signal amplified?
5. If the bandwidth of the channel is 5 Kbps, how long does it take to send a frame of 100,000 bits out of this device?
6. The light of the sun takes approximately eight minutes to reach the earth. What is the distance between the sun and the earth?

(b) A signal has eight data levels with a pulse duration of 2 ms. Calculate the pulse rate and bit rate Marks 03 CLO 1

Name: Mohsin Ali

I.D 13746

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Paper: Subject CCN

Teacher Name: Sir waqas.

Q1

(a)

1)

Sol

The Data rate is 100 Kbps for each case, we calculate first the value of f/N Then use the given figur to find P(energy peer Hz) All calculation are approximateon

a. $f/N = 0/100 = 0 \rightarrow P = 1.0$

b. $f/N = 50/100 = 1/2 \rightarrow P = 0.5$

c. $f/N = 100/100 = 1 \rightarrow P = 0.0$

(2)

(a)

In low-pass signal $B = f_{max} = 200\,KHz$

Nyquist Sampling rate $= 2 \times 200\,KHz$

$= 400000$ Sampel/sec

(b) $f_{max} = 100 + 200\,KHz = 300\,KHz$

Nyquist Sampling rate $= 2 \times 300\,KHz$

$= 600000$ Sampel/sec

3.

a

Bite rate = sampling rate x number of bite per sample

$= f_s \times n_b$

$n_b = \log_2 1024 = 10$ bits

$f_s = 2 \times 200\,kHz = 400\,kHz$

Bite rate $= f_s \times n_b$

$= 400 \times 10$

$= 4\,mbps$

b) $SNR_{db} = 6.02 n_b + 1.76\,dB = (6.02 \times 10) + 1.76$

$= 60.2 + 1.76$

$SNR = 61.96$

(3)

C $B_{min} = n_b \times B_{analog}$

Banalog represent the bandwidth of analog signal

$B_{min} = 10 \times 200\ kH_z$

$= 2000\ kH_z$

Q1:

(4:)

Ans:

Here bandwidth = 200 KHz = 200000 Hz

∴ The maximum data rate can be Calculated as

$N_{max} = 2 \times B \times n_b$

$= 2 \times 200000 \times \log_2 4$

$= 8 \times 10^8\ bps = 800\ kbps$

(4)

Q7 (a)

- We need to draw the graph for

(a) 01010101

(b) 00110011

NRZ-L, NRZ-I, manchester B-AMI

and we need to find the band width

NRZ-L

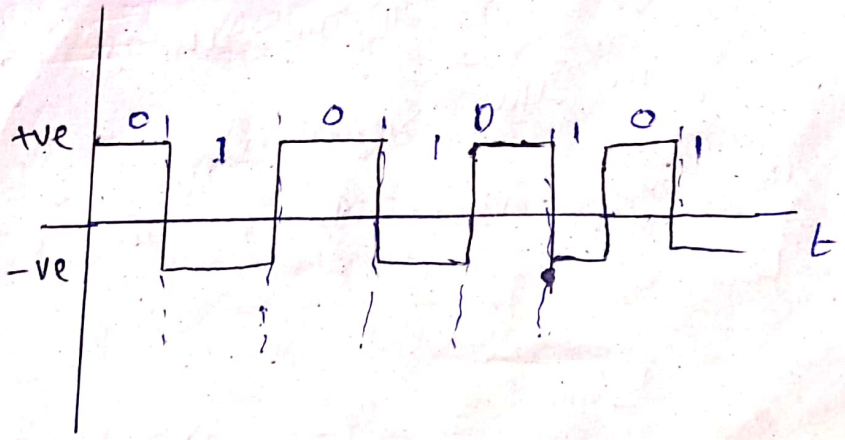
In NRZ-L the voltage levels are both sides of the Time axis

Voltage level +ve = 0

Voltage level -1V = 1

graph for NRZ-L (01010101)

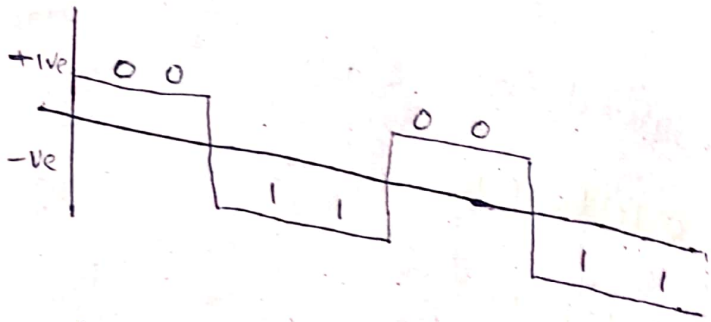
(a)



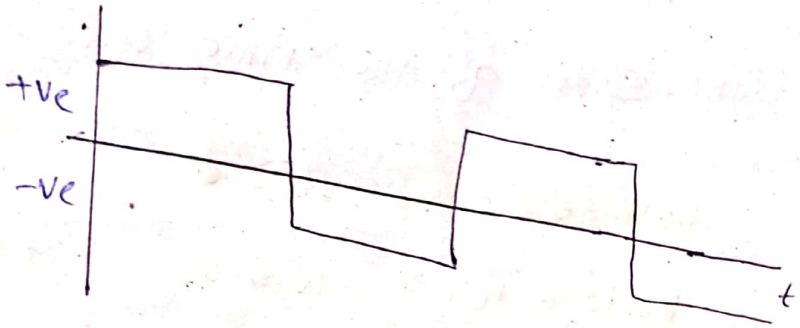
p.t.o

for

00110011



NRZ-L has a average signal note is = N/2 means avetag number of chang in the signal level the maximum band width for average level



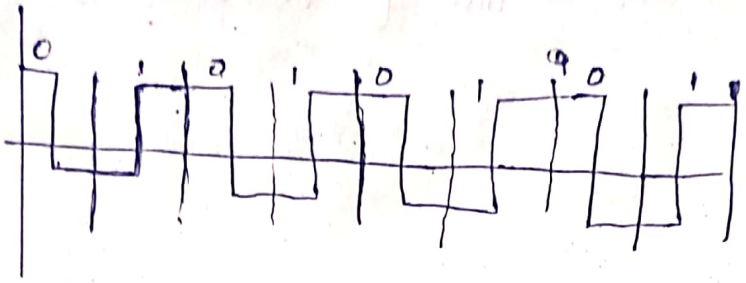
NRZ-L has avetage signal note is N/2 means average no of charg in the signal level the minimum baind width for average band tat is

$B_{min} = S = N/2$ N → bit rate

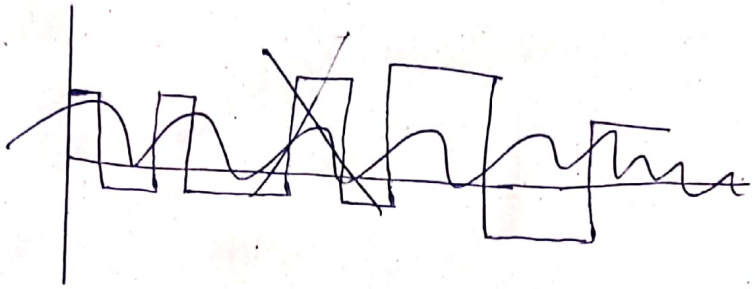
$$B_{min} = \frac{N}{2}$$

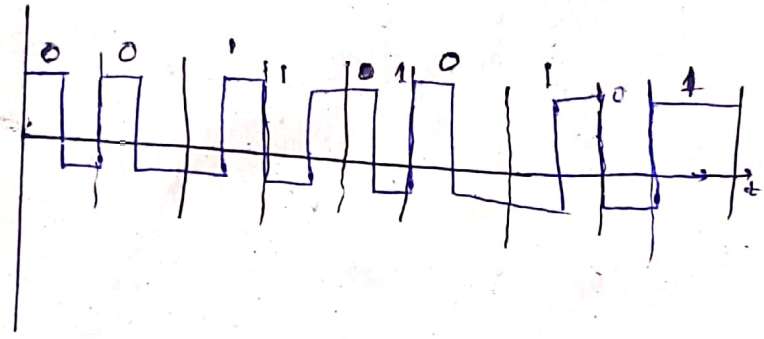
Manchester Scheme:

1)



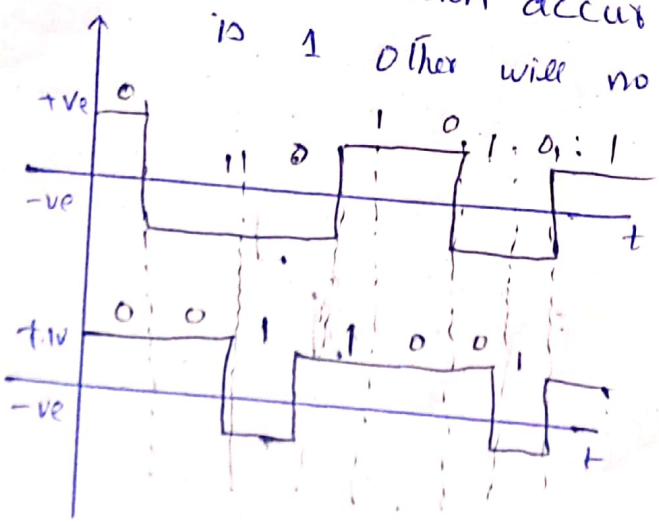
2)





NRZ – I

This is same as NRZ-L but inversion occur when next bit is 1 Other will no inversion

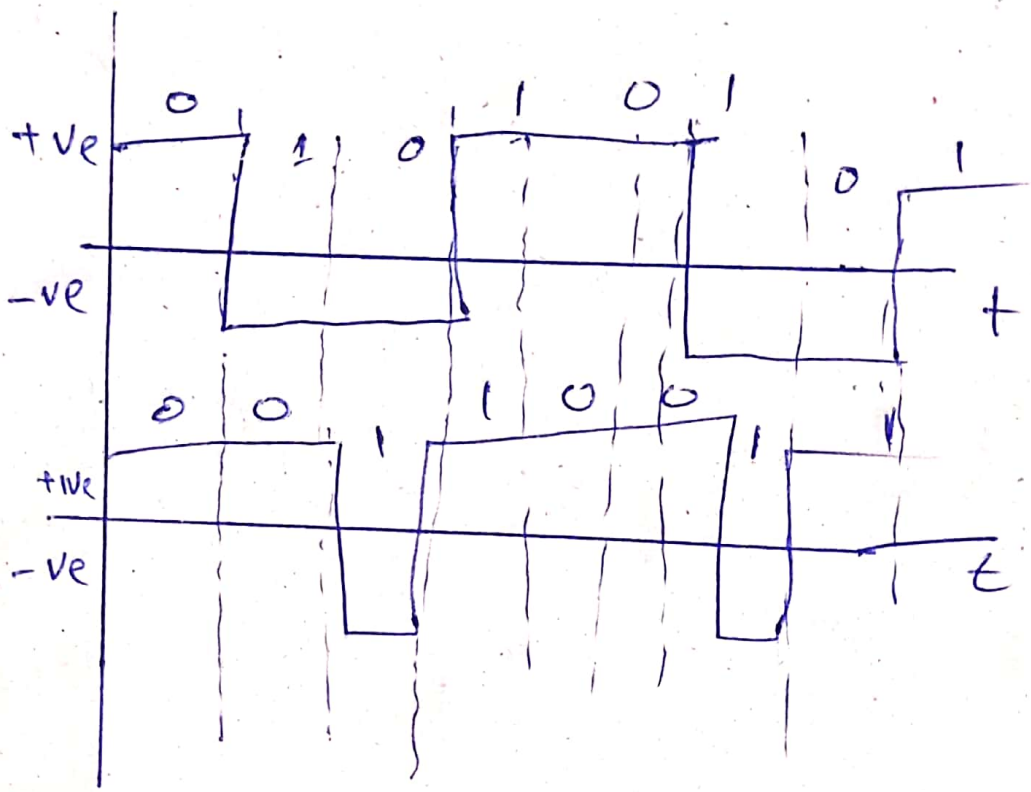


P.T.O

This is The Same as NRZ-2

but inversion occur when next bit is 1 other will no inversion

NRZ-1



Average signal rate of NRZ-1 is

$= N/2$

$B_{min} = N/2$

Q:3 (1)

Given data:

Tv Channal band width (B) = 6MHZ

using The first hormonic

Band width (B) = $\frac{\text{data rate (bit rate)}}{2}$

Data rate = 2 x B

= 2 x 6 = 12

There fore data rate = 12 Mbps

Using The first and Three hormonic ~~with eq~~. A better result can be achived by using The 1st and 3rd hormonic with The required band width (B) = $\frac{3 \times \text{data rate}}{2}$

Data rate = $\frac{2 \times B}{3}$

= $\frac{2 \times 6}{3}$ = 4 Mbps

Using The 1st and 5th hormonic

Band width = $\frac{5 \times \text{data rate}}{2}$

= $\frac{2 \times B}{5}$ = $\frac{2 \times 6}{5}$ = 2.4 Mbps

Q3

2 Past

The attenation (dB) = $10 \log_{10} \frac{B}{A}$

$10 \log_{10} (90/100)$

$= 10 \log_{10} (0.9)$

$= 10(-0.046)$ since

$10 \log_{10} (0.9) = -0.046$

Attenation (dB) = -0.46 dB

Q3

3

Attenation is the reduction of Stregnth in the power of a signal due to external factors

The extend of reduction is measur in dB

Given

$P_s = 5W$

Attenation = -10db

Therefore ~~-10 = -10~~.

(10)

$-10 = 10\log_{10}(Pd/5)$

$Pd = 10^{-1} \times 5$

$\boxed{Pd = 0.5\,w}$

Q3

6:

Given data:-

$t = 8\,mint = 8 \times 60 = 480\,sec$

Speed of Vecume $= 3 \times 10^8\,m/s$

distance $= ?$

we know

$Speed = \frac{distance}{time}$

$distance = 480 \times 3 \times 10^8 = 1.44 \times 10^{11}\,m/se$

Q3:

(4)

A signal was passed through 3 cascaded amplifies each with a 4db gain

Total gain (P_{db}) = 3 × 4dB

$P_{db} = 12dB$

$P_{db} = 10 \log_{10} P$

$P = 10^{\frac{P_{db}}{10}}$

$= 10^{\frac{12}{10}}$

$P = 15.85$

Q3

(5)

Bandwidth = 5kbps

= 5000bps

(1kbps = 1000kbps)

it takes time to send a frame of 100,000 bits out of this device

p.t.o

$$T = \frac{100,000}{5000}$$

$$T = 20 \text{ sec}$$

Q3 b part

8 Levels

2 ms

$$\text{Puls rate} = \frac{2}{10^{-3}} = 2000$$

$$\text{Bit rate} = 2000 \times \log_2 8$$

$$= 6000$$

6000 bps