Department of Electrical Engineering

Final – Term Assignment Spring 2020

Date: 22/06/2020

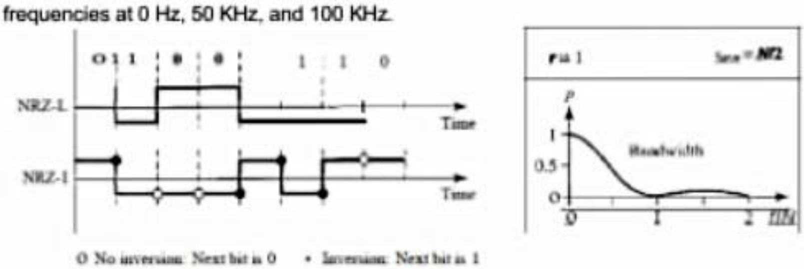
Course Details

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

structor: Sir M Waqas **Total Marks:** 50

Student Details

me: Iqbal Hussain **Student ID:** 13690

(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.  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.	Marks 20 CLO 1
(a)	Draw the graph of the NRZ-L, NRZ-I, Manchester and differential Manchester scheme using each of the following data streams a. 01010101 b. 00110011	Marks 16 CLO 1
(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? 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?	Marks 12 CLO 1
(b)	A signal has eight data levels with a pulse duration of 2 ms. Calculate the pulse rate and bit rate.	Marks 02 CLO 1

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Q:1 (a)
Ans:

(i) $\frac{f}{N} = \frac{0\,Hz}{100} = 0$

$P = 1.0$

(ii) $\frac{f}{N} = \frac{50}{100}$

$= \frac{1}{2}$

$P = 0.5$

(c) $f/N = \frac{100}{100}$

$= 1$

$P = 0.0$

Q:1 Ans: (2)

Low pass Signal:

$B = f_{max} = 200\ KHZ$

Nyquist sampling Rate = $2 \times 200\ KHZ = 400000$ samples per second.

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

Nyquist Sampling Rate $= 2 \times 300\ KHZ$

$= 600000$ Samples Per second.

Q: 11 Ans: (3)

Solution:

$B = f_{max} = 200 \times 10^3\ Hz$

$L = 1024$

(a) Bit rate $= f_s \times n_b$

$f_s = 2 \times f_{max}$

$n_b = \log_2 1024$

$= \log_2 2^{10}$

$= 10^5$

Bit rate $= f_s \times n_b$

$2 \times 200 \times 10^3 \times 10$
4 mbps

(b) SNRdB = 4 X nb + 1.76 dB

= 4 X 10 + 1.76 dB

= 41.76 dB.

(c) Bmin = nb x Banalog

Banalog represent the bandwith of analog signal

Bmin = 10 x 200 KHZ
= 2000 KH.

Q: 1 4

Ans:

Solution:
Bandwith = 200 KHZ
= 200000 HZ

the maximum data rate can be calculated as

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

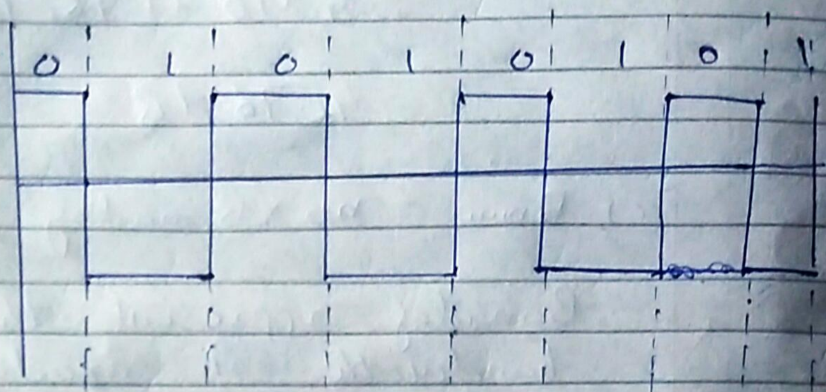
$= 2 \times 200000 \times \log_2 40$
$= 8 \times 10^8$ bps

= 800 Kbps

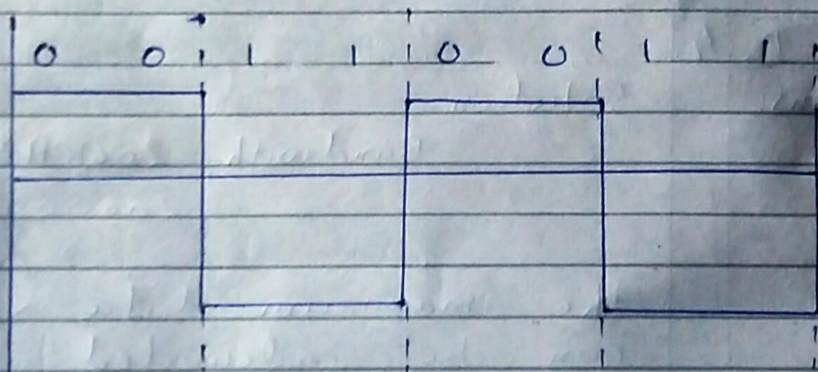
Q:2 (a)
Ans:

NRZ L

(i) 01010101



(ii) 00110011



Average number of changes = $\frac{(+8+4)}{2}$

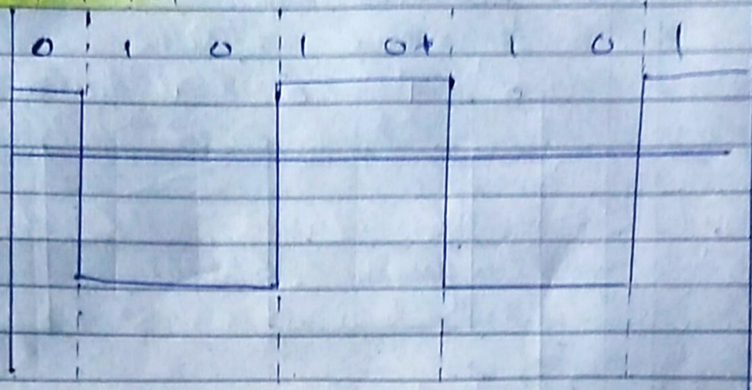
= $\frac{12}{2}$ = 6 for N = 6

for N - 8

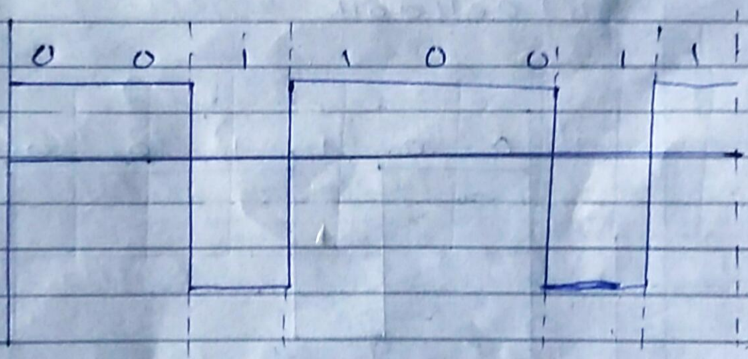
bandwith B -> (6/8) N

NRZ i :-

(i) 01010101



(ii) 00110011

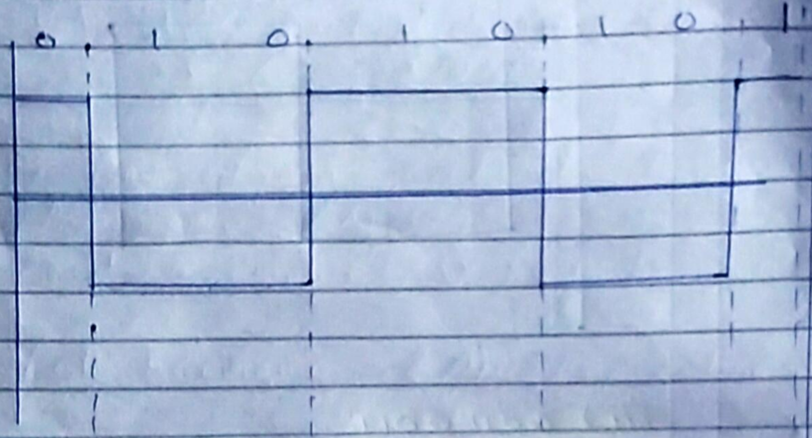


Average number of changes
(48+4) / 12 = 46 for N = 8

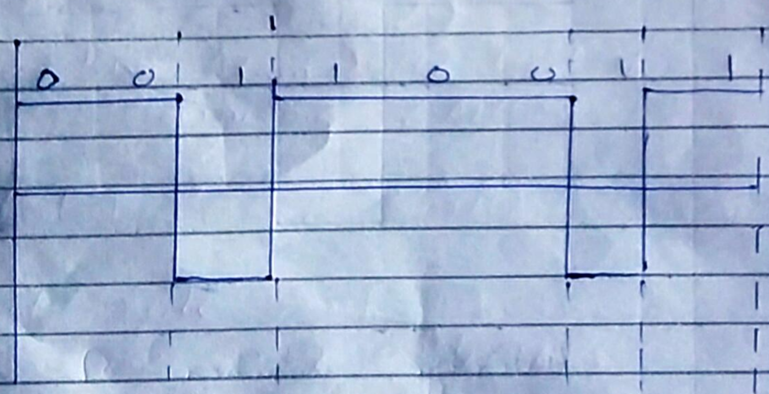
bandwith B -> (4/8) N

Manchester sheme:

(i) 01010101



(ii) 00110011

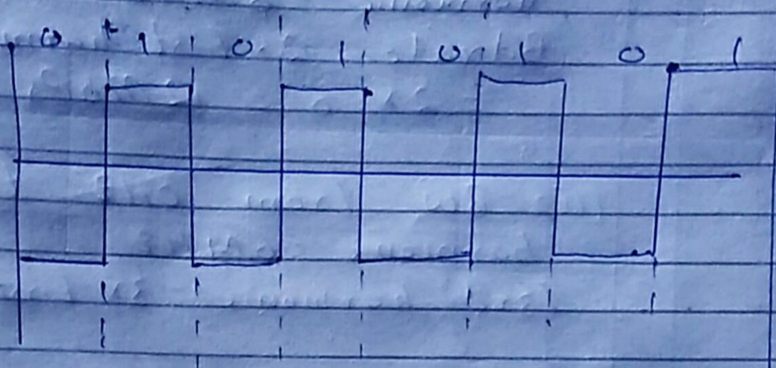


Average number of changes
= (8+12)/2 = 10 for N = 8

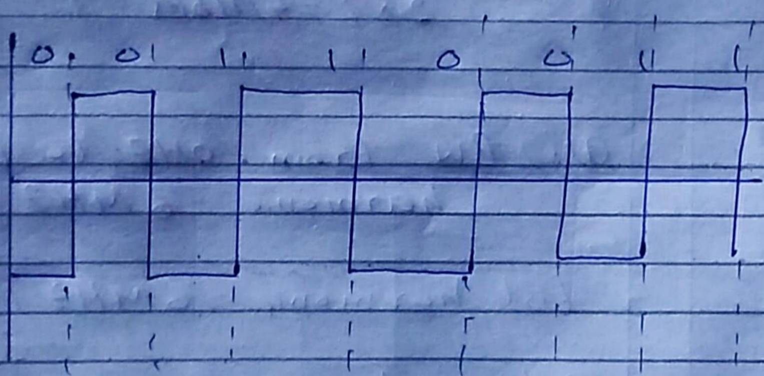
Bandwith B -> (10/8) N

Differential Manchester Scheme:

(i) 01010101



(ii) 00110011



Average Number of changes

$= (12+12)/2 = \frac{24}{8} = 4$ for

$N = 8$

Bandwidth $B \rightarrow (4/8) N$

Q 3 (a) (1)
Ans:

BW = 6 MHZ

(i) BW from 0HZ to fist harmonic = 6 MHZ

Bitrate = 2 × fist harmonic
= 2 × 6 = 12 MbPs

(ii) BW from 0HZ to f3rd harmonic = 6 MHZ

f3rd harmonic = 3 × first harmonic

fist harmonic = 6 MHZ / 3 = 2 MHZ

Bitrate = 2 × fist harmonic =
2 × 2 = 4 MbPs

(iii) BW from 0HZ to f5th harmonic = 6 MHZ

fist harmonic = 6 MHZ / 5 = 1.2 MHZ

Bit rate = 2 × fis harmonic
= 2 × 1.2 = 2.4 MbPs

Q 3. (2)
Ans:

Solution:

Attenuation of a signal
= 10 x log (input power / output power)

logrithm is to the Base 10.

Here Power at point A is the input power.

Power B is the output power.

therefore:-
Attenuation in dB = 10 x log (100/90)

= 0.4575 dB

Q:3 (3)
Ans:

Solutions
$P_s = 5w$
Attenuation = -10 dB

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

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

$Pd = 0.5w$

Q:3 (4)

Ans:

Total gain (Pdb) = 3×4 dB

$PdB = 12dB$

the signal is amplified then

$Pdx = 10 \log_{10} P$

$P = 10^{\frac{PdB}{10}}$

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

$P = 12$

Q.3 (5)
Ans.

Given:

$B = 5 Kbps$
$= 5 \times 10^3 Hz$
$n_b = 100,000$

To find
Bit Duration

using Nyquist therom

Bit Rate $= 2 \times B \times \log_2 L$

$n_b = \log_2 L$
wher L = no of levels

Bit Duration $= 100,000 \div (2 \times 5 \times 10^3 \times 100,000)$

$= 0.001 ms$

Q.3 6
Ans.

Solution:
total time = 480 sec

Speed of light in vacum is $3 \times 10^8 m/s$

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

distance = speed × time

$$\text{distance} = 3 \times 10^8 \times 500$$

distance = 150,000,000 Kilometer

obviously these are not scientifically accurate calculation. the time will not be exactly correct and distance between earth and sun is going to change as earth revolves in elliptical orbit.

Q:3 (b)

Ans:

Solution:

$$\text{Pulse rate} = \frac{1}{2ms} = 500 \text{ pulse/sec}$$

$$\text{Bit rate} = \text{pulse rate} \times \log_2 L$$

$$= 500 \times \log_2 8$$

$$= 1500$$