Department of Electrical Engineering
Final – Term Assignment Spring 2020
Date: 22/06/2020

Course Details

Course Title: Computer Communication Network **Module:** 06
Instructor: **Total Marks:** 50

Student Details

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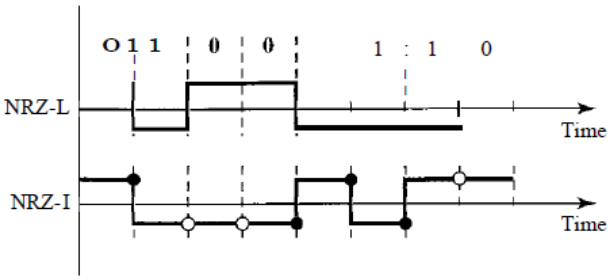
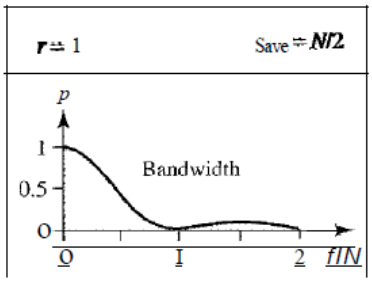
Q1.	(a)	1. An NRZ-I signal has a data rate of 100 Kbps. Usingthe following Figure, calculate the valueof the normalized energy (P) for frequencies at 0 Hz, 50 KHz, and 100 KHz.   0 No inversion: Next bit is 0 • Inversion: Next bit is 1 2. What is the Nyquist sampling rate for each of the following signals? a. A low-pass signal with bandwidth of 200 KHz? b. A band-pass signal with bandwidth of 200 KHz if the lowest frequency is100 KHz? 3. We have sampled a low-pass signal with a bandwidth of 200 KHz using 1024 levelsof 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 weuse four levels of digital signaling.	Marks 20 CLO 1
Q2.	(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
Q3.	(a)	1. A TV channel has a bandwidth of 6 MHz. If we send a digital signal using onechannel, what are the data rates if we use one harmonic, three harmonics, and fiveharmonics? 2. A signal travels from point A to point B. At point A, the signal power is 100 W. Atpoint 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 originally5 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 of100,000 bits out of this device? 6. The light of the sun takes approximately eight minutes to reach the earth. What isthe distance between the sun and the earth?	Marks 12 CLO 1
	(b)	A signal has eight data levels with a pulse duration of 2ms.Calculate the pulse rate and bit rate.	Marks 02 CLO 1

Syed. M. Zahoor , 12595

Solution:-

Given Data

Data Rate = 100 kbps

(a) frequency = 0 KHz ⇒ P = 1

(b) frequency = 50 KHz = 50 KHz = 0.5×10^3

(c) frequency = 100 KHz ⇒ P = 100 KHz ÷ 100 kbps

= 1

Solution:-

(a) $f_s = 2 \times f_m = 2 \times 200 = 400$ k samples/sec

Low-pass Signal The min frequency 0

Therefore we have

$f_{max} = 0 + 00 = 200$ KHz

$f_s = 2 \times 200.000 = 400.000$

(b) A band pass signal with band width of 200 KHz if the lowest frequency is 100 KHz

$f_{max} = 100 + 200 = 300$ KHz

$\rightarrow f_s$ $2 \times 300.000 = 600.000$ samples/s

(a) (2)
(3)

Solution:

Calculate the bite of the digitized Signal:-

In a lowpass signal, the min frequency is 0 Therefore we can say

$f_{max} = 0 + 200 = 200\,KHZ \rightarrow f_s = 2 \times 200,000$

$= 4000,000$ Samples/s

The Number of bits per Sample and the bit rate are

$n_b = \log_2 1024 = 10$ bits/sample N

$= 400\,kHz \times 10 = 4$ Mbps

(b) The Value of $n_b = 10$

$SNP_{dB} = 6.02 \times n_b + 1.76$

$= 61.96$

(c) The Value of $n_b = 10$. The min bandwidth can be calculated as

$B_{PCM} = n_b \times B_{analog}$

$= 10 \times 200\,KHZ$

$= 2MHZ$.

(3)

Solution

Given Data:-

Here, band width = 200 kHZ

= 200000 HZ

The max data rate can be calculated as

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

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

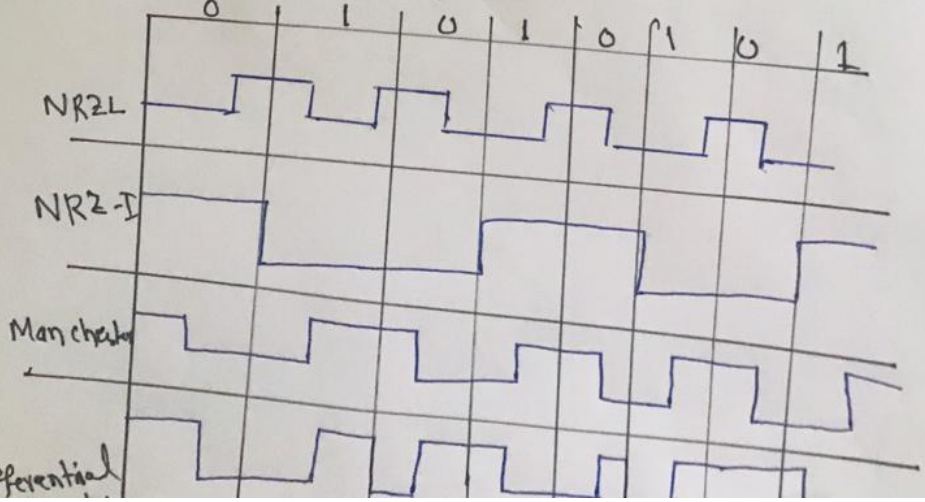
$= 8 \times 10^4$ bps

$= 800$ kbps

(2) Draw the graph of the NRZ-L and NRL-I

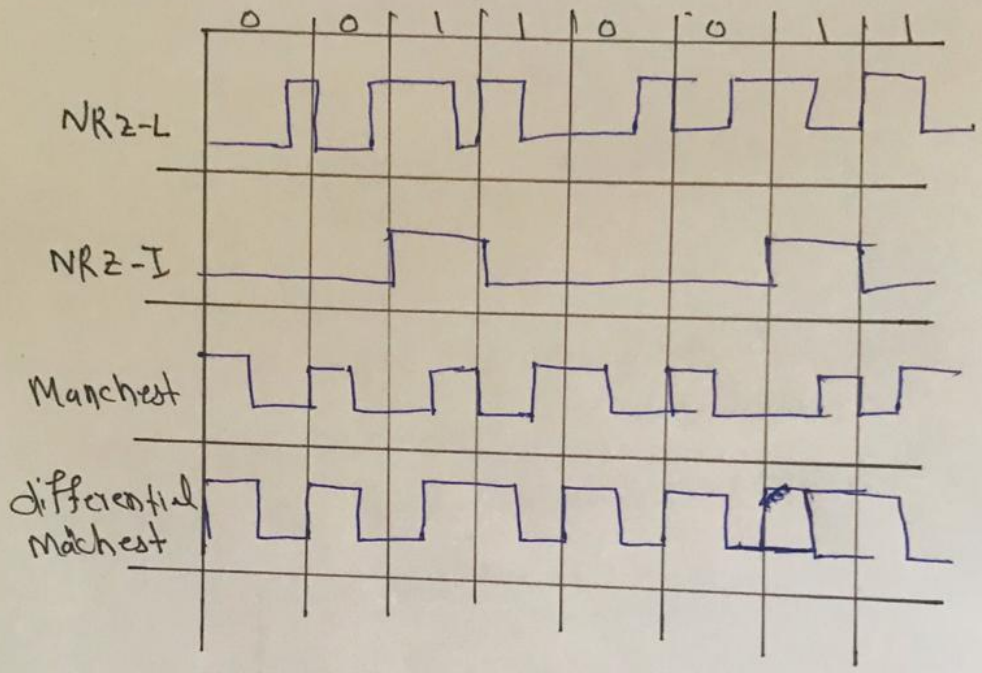
(9) 01010101

Solution



Q6 (b) 00110011

Solution



Ans:-

① BW from 0Hz to first harmonic = 6MHz.

Bit rate = 2* first harmonic = 2x6
= 12Mbps

② BW from 0Hz to 3rd harmonic = 6MHz

f3rd harmonic = 3* first
f1st " = 6/3 = 2MHz

Bit rate = 2x first harmonic
= 2x2 = 4Mbps

③ BW from 0Hz to 5th harmonic = 6MHz.

f1st = 6MHz/5 = 1.2MHz

Bit rate = 2xf1st = 2x1.2
= 2.4Mbps

Solution

Attenuation of Signal = $10 * \log \frac{\text{(Input power)}}{\text{(output power)}}$

logarithm is to the base 10

$$dB = 10 \log_{10}\left(\frac{90}{100}\right)$$

$$= -0.046 dB$$

(3)

Solution

$$dB = 10\log_{10}\frac{P_2}{P_1} \rightarrow -10 = 10\log_{10}\frac{P_2}{5}$$

$$\log_{10}\frac{P_2}{5} = -1$$

$$\frac{P_2}{5} = 10^{-1}$$

$$P_2 = 0.5\,W$$

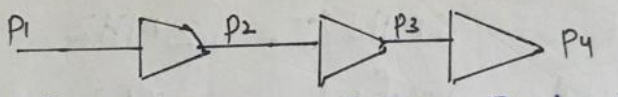
(02)

(04)

Solution:-

Total gain = 4dB + 4dB + 4dB

= 12dB



for Power gain of the first stage

$$4\,dB = 10 * \log_{10}\frac{P_2}{P_1}$$

$$\frac{P_2}{P_1} = \left(10^{\left(\frac{4}{10}\right)}\right) = 2.512$$

for Powor gain of Three stages

$2.512 * 2.512 * 2.512 = 15.851$

or

$$12\,dB = \log_{10}\frac{P_4}{P_1} \rightarrow \frac{P_4}{P_1} = \left(10^{\left(\frac{12}{10}\right)}\right) = 15.85$$

(5) (6) (7)

(3) Solution :-

Given,

Bandwidth 5000bps

frame 100,000 bit

$$\Rightarrow \frac{100000\ b}{5000\ bps} = 20\ Sec$$

(6) Solution :-

The exact taken by to reach the earth from Sun 8min and 2ose = 500 seconds

(03) (04) Speed of light Vacuum is 3×10^8 m/s

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

$$Distance = speed \times time$$

$$= 3 \times 10^8 \times 500$$

Distance. = 150,000,000,000 meter

or 150,000,000 kilometer

(03)

(b) Solution:

Pulse Rate = 1/2 ms = 500 pulse per second

Bit Pulse = Pulse $\times \log_2 L$

$= 500 \log_2(8)$

$= 1500$ bps Ans