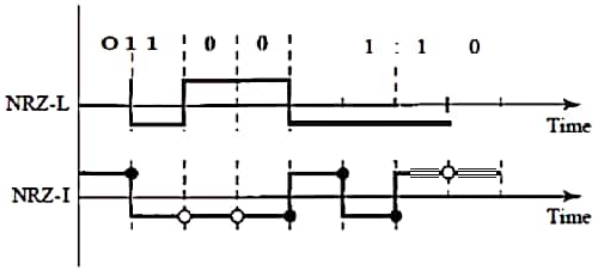
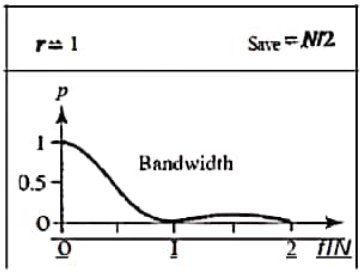
Department of Electrical Engineering
Final – Term Assignment Spring 2020
Date: 22/06/2020

Course Details

Course Title: Computer Communication Network **Module:**
Instructor: **al Marks:**

Student Details

Name: **Student ID:**

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.   0 No inversion: Next bit is 0 • Inversion: Next bit is 1 1. 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? 1. 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. 1. What is the maximum data rate of a channel with a bandwidth of 200 KHz if we use four levels of digital signaling.	Mar CL
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	Mar CL(
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? 1. 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? 1. The attenuation of a signal is -10 dB. What is the final signal power if it was originally 5 W? 1. 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? 1. 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? 1. The light of the sun takes approximately eight minutes to reach the earth. What is the distance between the sun and the earth?	Mar CL(
	(b)	A signal has eight data levels with a pulse duration of 2 ms. Calculate the pulse rate and bit rate.	Mar CL(

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Q:(1) On NRZ-I Signal has a Data rate of 100Kbs, Calculate the value of normalized energy (P) for frequencies at 0Hz, 50KHz and 100KHz

Sol
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As we know the data rate is 100Kbs. We Calculate the value of F/N first.

for 0Hz

(a) $F/N = \frac{0}{100} = 0 \rightarrow P = 1.0$

$P = 1.0$

(b) $F/N = 50/100 = 1/2 \rightarrow P = 0.5$

(c) $F/N = 100/100 = 1 \rightarrow P = 0.0$

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Q(2) what is Nyquist rate
(a) Low pass signal with bandwidth of 200KHz?
(b) with bandwidth of 200KHz if the lowest frequency is 100KHz

Sol
(a) In low pass signal

$B = f_{max} = 200KHz$

So Nyqui's sampling rate is $2 \times 200KHz = 400000$. Samples per second.

(b) Band pass signal has lowest frequency of 100KHz So

$100 + 200 = 300KHz$

Q(2) We have Sampled a low pass Signal with a bandwidth of 200 KHz Using 1024 level of quantization.

(a) Bit rate?

(b) SNRdb for Signal?

(c) PCM bandwidth?

Sol

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

$= 2 \times 200 \times 10^3 \times 10$

$= 4$ Mbps

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

$n_b = 10$

So $6.02 \times 10 + 1.76$ dB

$= 61.96$ dB

(4) (1 M)

Nyquist Sampling rate = $2 \times 300\ KH_z$ (Ali Raza 12647)

$= 600000$ Samples/second

X X

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(5)

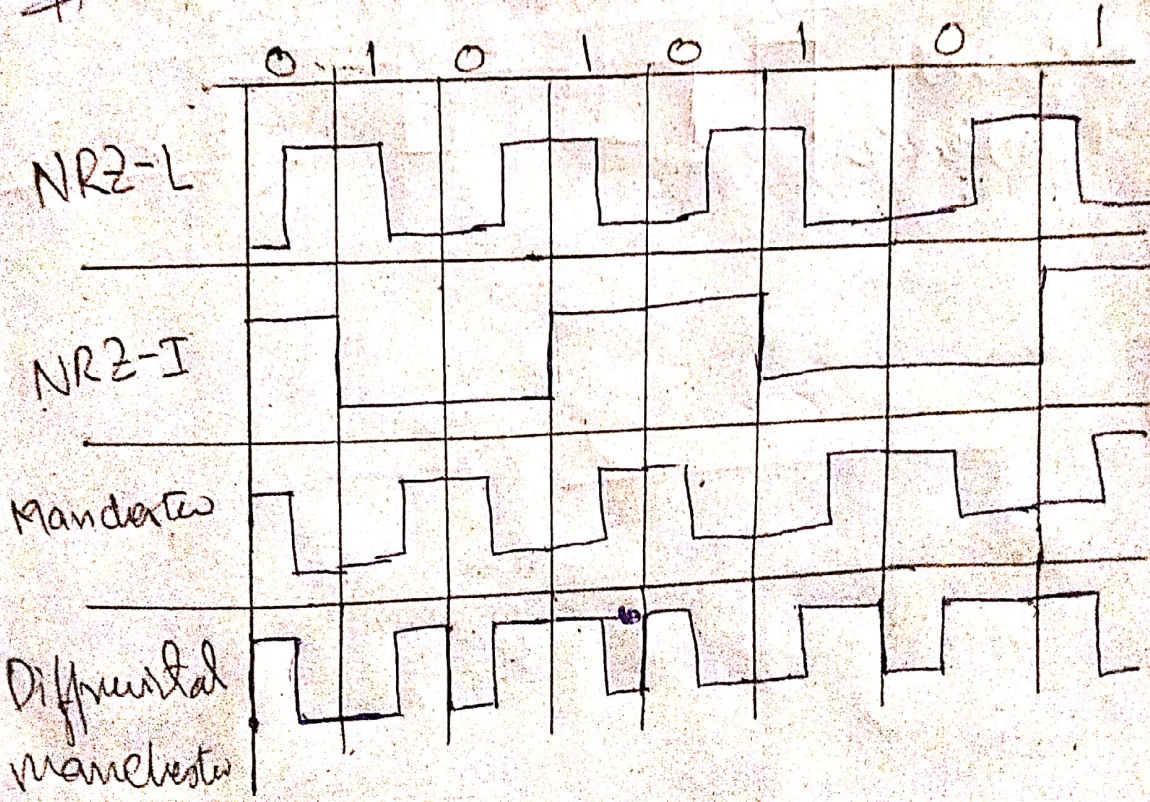
Q2 Draw the graph of NRZ-L, NRZ-I, Manchester and manchester differential scheme using each of the following streams

(a) 01010101

(b) 00110011

Sol

#



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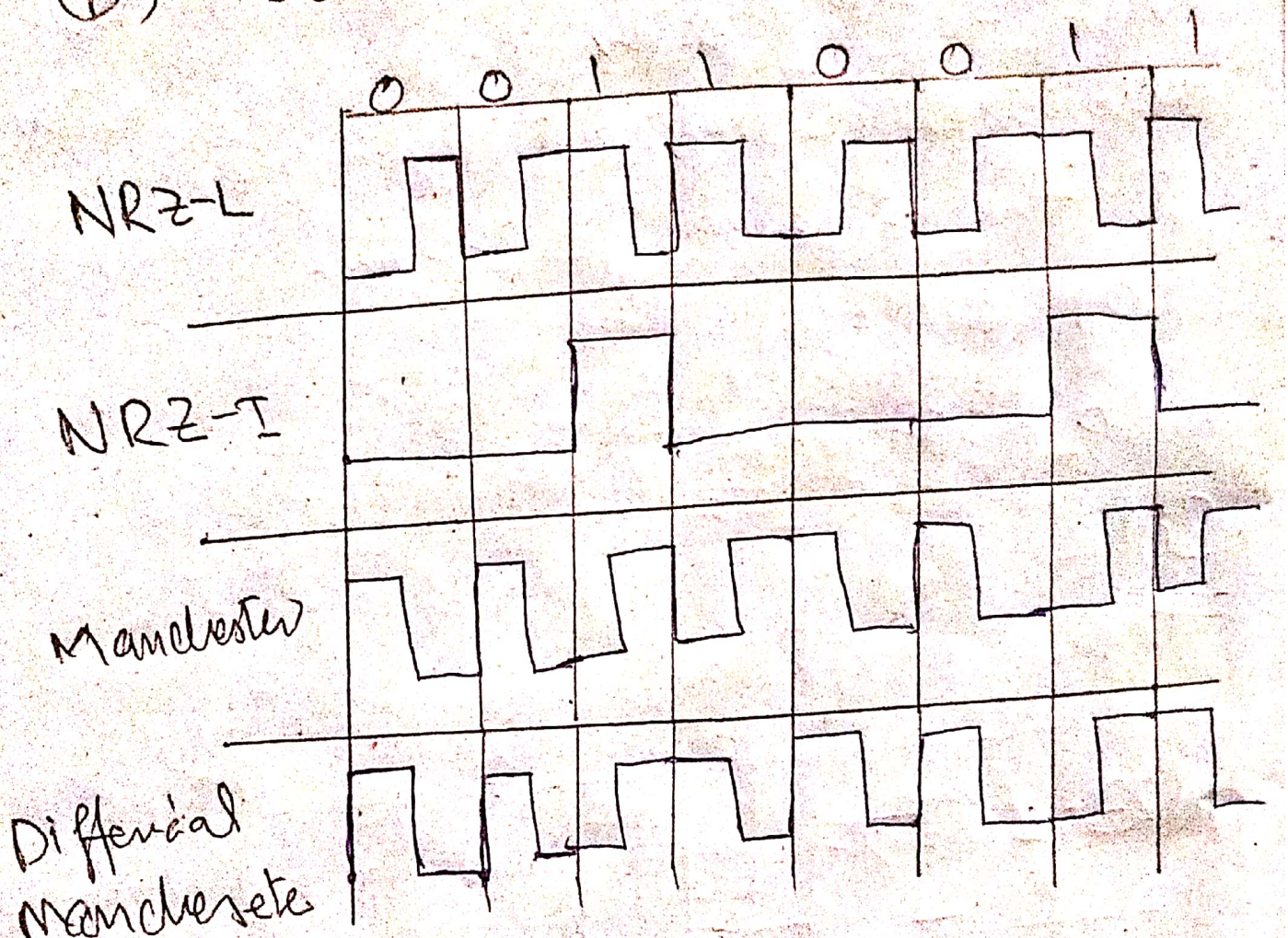
(6)

(b) 00110011



Q3

(a) (i) A TV channel has a bandwidth of 6MHz, if we send a digital using one channel what are the data rates, if we use one harmonic, three harmonic and five harmonic;

Sol

Bandwidth = 6 MHz

(1) Bandwidth from 0Hz to first harmonic = 6MHz

Bit rate = 2 × f ~~first~~ one harmonic

= 2 × 6 = 12 Mbps

(2) Bandwidth from 0Hz to 3rd harmonic

f 3rd harmonic = 3 × f 1st harmonic

= $\frac{6MHz}{3}$ = 2MHz

Bit rate = 2 × f 1st harmonic

= 2 × 2 = 4 Mbps

(3) Baud width from 0Hz to 5th harmonic

= 6MHz

f 1st harmonic = $6/5$ = 1.2MHz

Bit rate = 2 × f 1st harmonic

= 2 × 1.2 = 2.4Mbps

Q3 (a) Alivaqarkhan 12647

(b) A Signal has eight data levels with pulse duration of 2ms, Pulse rate? Bitrate?

Sol

Pulse rate $= \frac{1}{2 \times 10^{-3}} = 500$ pulses/sec

Bit rate = Pulse rate $\times \log_2 L$

$L = 8$

So

Bit rate $= 500 \times \log_2(8)$

$= 2000$ bps

Kbps

(10)

Q3/a)(4)

= A Signal is passed trough three cascade amplifier each with a 4 db gain. how much the Signal Amplified?

Sol# Signal is pass through three amplifiers So Signal power is improved 3 times and each time the attenuation is 4db.

Total gain = 3x4 = 12db

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Q3 (5)

(a) if the bandwidth of the channel is 5Kbps, how long does it take to send a frame of 100,000 bits out of this device?

Sol

$B = 5$ Kbps

$Nb = 100,000$

Bit duration = ?

$$\text{Bitrate} = 2 \times B \times \text{Log}_2 L$$

$$\text{Bit duration} = 100,000 \div (2 \times 5 \times 10^3 \times 100000)$$

$$= 1 \text{ mS}$$

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Q3(a)(6)

The light to the Sun takes approximately 8 min to earth. What is distance b/w Sun and earth?

Sol

Time take to reach us from Sun is 8.3 min

$$z = 8.3 \times 300{,}000$$

Speed of light is in km/sec so Convert min to seconds.

$$1 \text{ min} = 60 \text{ sec}$$

$$8.3 \text{ min} = 8.3 \times 60$$

$$= 498 \text{ seconds}$$

$$z = 498 \times 3 = 149400000 \text{ km}$$

$$z = 149.4 \text{ million km}$$