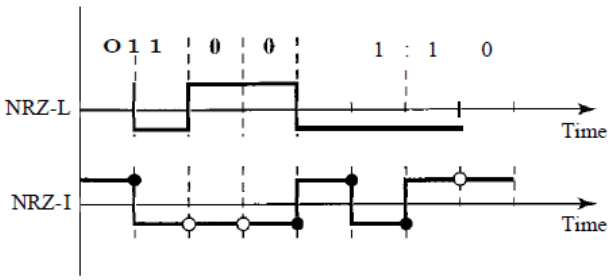
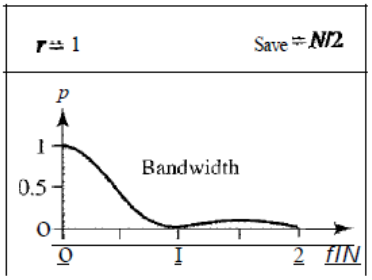
Department of Electrical Engineering
Final – Term Assignment Spring 2020
Date: 22/06/2020

Course Details

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

Student Details

Name: Rafaqat ullah khan **Student ID:** 14107

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 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
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 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

(ii)

Question ≈ 01 :-

Part :- (a) :-

Solution :-

Data Rate ≈ 100 KbPs

a) :- Frequency = 0 KHZ ⇒ P = 1

for NRZ-I, when f/N = 0

to power is taken as 1..

P = frequency ÷ Data rate.

b) :- Frequency = 50 KHZ

$P = 50 \div 100 = 0.5 \times 10^{-3}$

c) :- Frequency = 100 KHZ

P = 100 ÷ 100 = 1

Question = 1
Part :- 2
Sol:-

Nyquist sampling rate = $2 \times f_{max}$

a):- In low pass filter $B = f_{max} = 200\ KHz$
Now Nyquist sampling rate ⇒
$\Rightarrow 2 \times 200\ KHz$
$\Rightarrow 400,000$ samples/sec

b):- $f_{max} = 200 + 100 = 300\ KHz$
Nyquist sampling rate = $2 \times 300\ KHz$
" " " $\Rightarrow 600,000$ samples/sec

Question = 1 :-
Part = 3 :-
Sol:- $B = f_{max} = 200 \times 10^3\ Hz$
$L = 1024$

a):- Bit rate $= f_s \times n_b$
$= 2 \times 200 \times 10^3 \times 10$
$= 4\ Mb\ P.S$

$\therefore n_b = \log_2 1024$
$\therefore \Rightarrow \log_2 2^{10}$
$\therefore \Rightarrow 10$

b):- Bit rate = $f_s \times n_b$

$\Rightarrow 6.02 \times 10 + 1.76\ dB$

$\Rightarrow 61.96\ dB$ ✱

c):- The value of $n_b = 10$

$B_{PCM} = n_b \times B_{analog} \Rightarrow 10 \times 200\ KHz$

$\Rightarrow 2\ MHz$

Question. 01

Part = 4:-

Sol:- $B = 200 \times 10^3\ Hz$, $L = 4$

$N_{max} = ?$

$N_{max} = 2 \times B \times Log_2 L$

$\Rightarrow 2 \times 200 \times 10^3 \times Log_2 4$

$\Rightarrow 2 \times 200 \times 10^3 \times Log_2 2^2$

$\Rightarrow 400 \times 10^3 \times Log_2 2^2$

$= 8 \times 10^5$

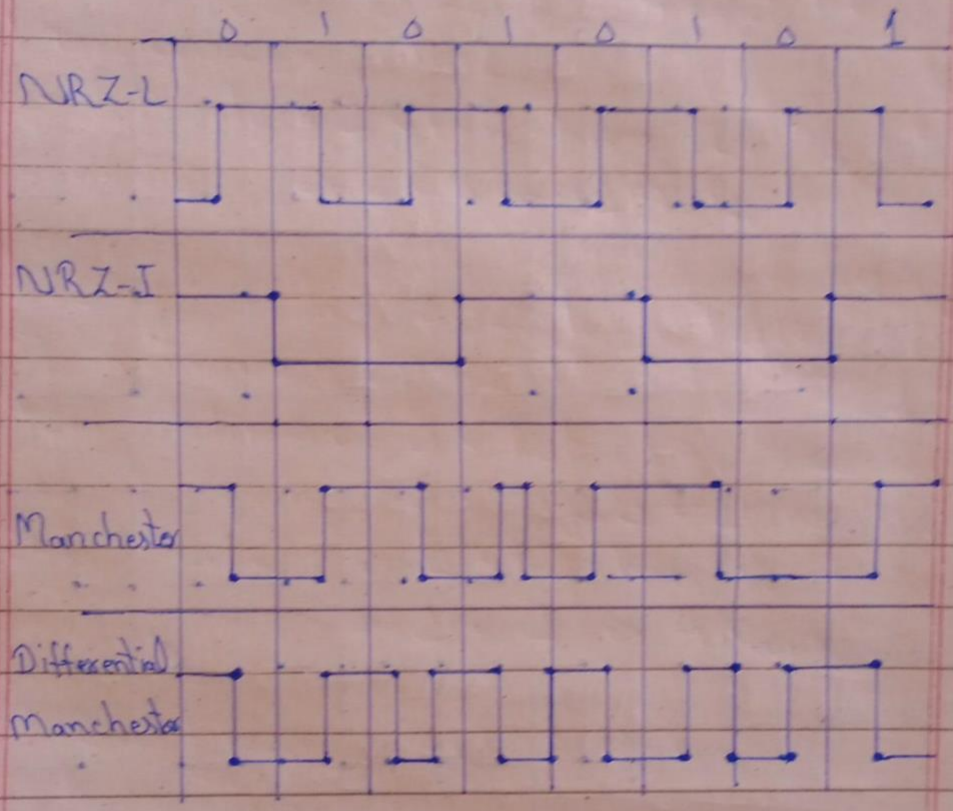
$= 800,000\ bps.$

(5):-

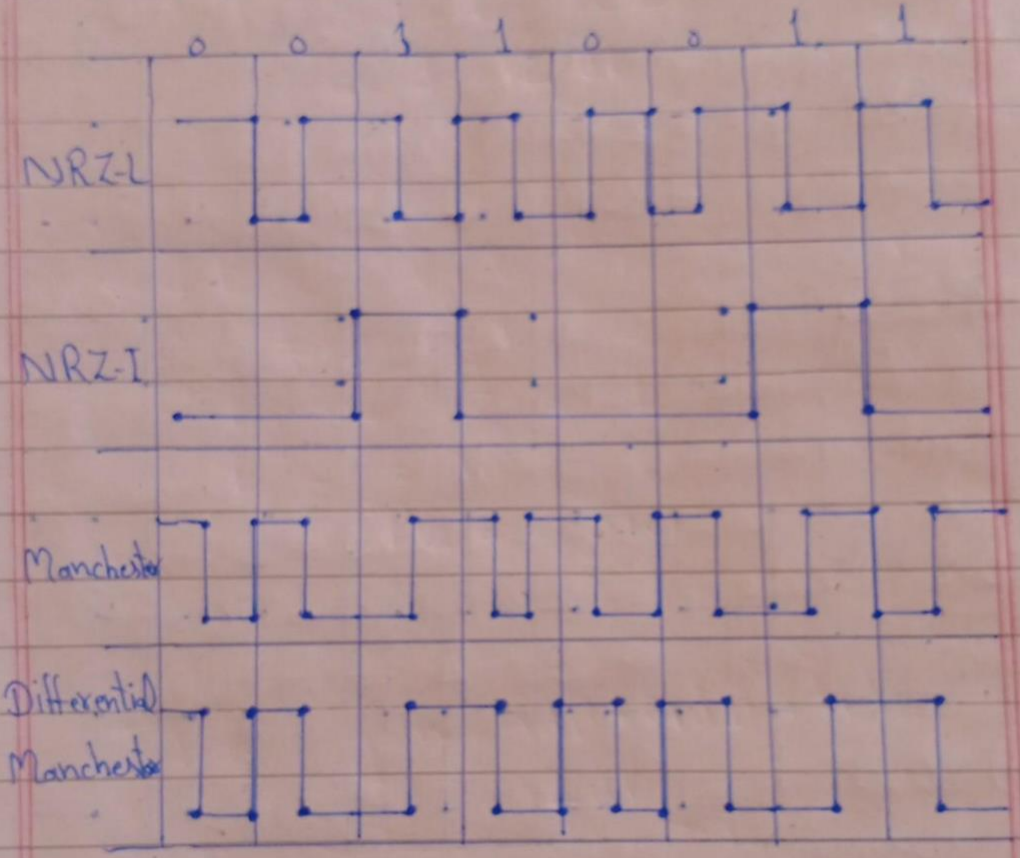
Question = 02:-

Part :- (a):-

Sol:-



Question = 2
Part :- (b) :-
Sol :-



Question 3 :-

Part :- (a) :- (1)

BW = 6 MHz

1) :- BW from 0Hz to f first

i) :- harmonic = 6MHz

⇒ Bit rate = 2 × first harmonic

⇒ 2 × 6 ⇒ 12 MbPS

⇒ ii) :- BW from 0Hz to f 3rd harmonic = 6MHz

f 3rd harmonic = 3 × fist harmonic

" " ⇒ 6MHz / 3 ⇒ 2MHz

Bit rate ⇒ 2 × fist harmonic

⇒ 2 × 2 ⇒ 4 Mbps

⇒ iii) :- BW from 0Hz to f 5th harmonic = 6MHz

fist = 6MHz / 5 ⇒ 1.2 MHz

Bit rate ⇒ 2 × fist ⇒ 2 × 1.2

⇒ 2.4 MbPS

Part:- (a) :- (2) :-

Sol:-

$$dB = 10 \log_{10} (100/50)$$
$$\Rightarrow 10 \log_{10} (2)$$
$$\Rightarrow 3.012 \text{ db}$$

Part:- (a) :- (3) :-

$$dB = 10 \log_{10} P_2/P_1$$
$$\Rightarrow 10 \log_{10} P_2/5$$
$$\log 10 = P_2/5 \Rightarrow 1$$
$$P_2/5 = 10^{-1}$$
$$P_2 \Rightarrow 0.5 W$$

Part:- (a) :- (4)

Total gain $= 4dB + 4dB + 4dB$
$= 12 dB$

For power gain of first stage

$$4 dB = 10 \times \log_{10} P_2/P_1$$
$$P_2/P_1 \; (10^{(4/10)}) = 2.512$$

Power gain of three (3) stages

$$2.512 \times 2.512 \times 2.512 \Rightarrow 15.851$$

Part :- (a) :- (5) :-

Given band width = 5000 bps

Frame = 100,000 bit

$\frac{100,000\ b}{5000\ bps} \Rightarrow$ 20 Seconds

Part :- (a) :- (6) :-

The distance between the earth and sun is 93,000,000 miles.

Question :- (3) :-

Part :- (b) :-

Pulse duration = 2 mS , L = 8

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

Bit rate = Pulse rate x $\log_2 L$

$\Rightarrow 500 \times \log_2 8$

$\Rightarrow 500 \times 3$

$\Rightarrow 1500$ bps

THE END