Date: _____

Question 1

1)

a) $\frac{f}{N} = \frac{0H_2}{100} = 0$

$P = 1.0$

b) $\frac{f}{N} = \frac{50}{100} = \frac{1}{2}$

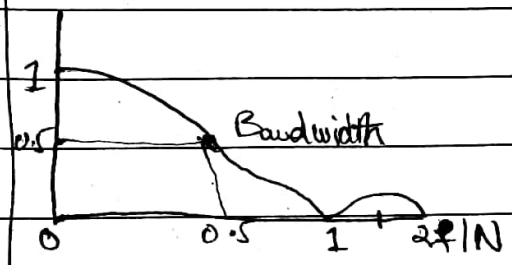
$P = 0.5$

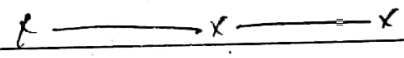
c) $\frac{f}{N} = \frac{100}{100} = 1$

$P = 0.0$

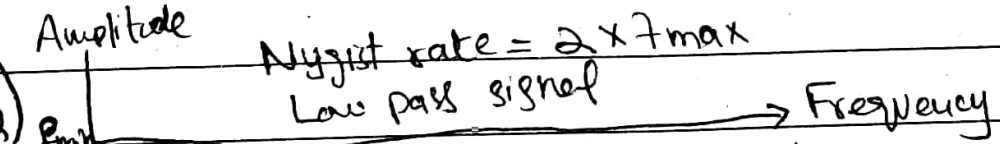
Given Data:-

Data Rate = N = 100 Kbps





2)



a) low pass signal $B = f_{max} = 200kH_2$

Nyquist Sampling Rate = $2 \times 200KH_2 = 400000$ Samples p/sec

b) $f_{max} = 100 + 200KH_2 = 300KH_2$

Nyquist Sampling Rate = $2 \times 300KH_2 = 600000$ Samples P/sec

Date: _____ (2)

3)

a) If we have low pass signal, The minimum frequency will be 0.

$f_{max} = 0 + 200 = 200\,KH_2 \rightarrow f_s = 2 \times 200{,}000$
$= 400{,}000$ samples p/sec

Bit rate $= n_b = \log_2 1024 = 10$ bit/sample
$N = 400\,KH_2 \times 10 = 4\,Mbps$

b) Value of $n_b = 10$. We can easily calculate the value of $SNR_{dB} SNR_{dB} = 6.02 \times n_b^{+1.76}$
$= 61.96$

c) The value of $n_b = 10$.
Minimum bandwith can be calculated as $B_{PCM} = n_b^x B_{analog}$
$= 100 \times 200\,KH_2 = 2\,MH_2$

x ——— x ——— x

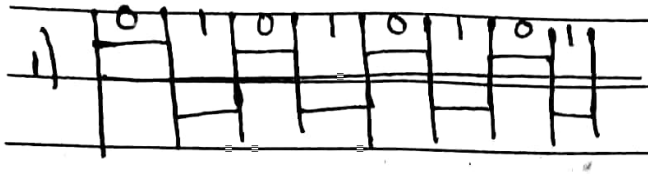
4)

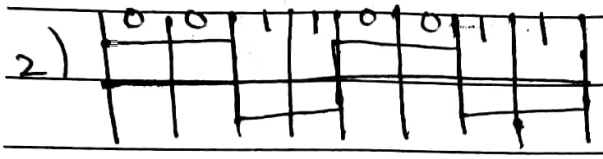
Bandwith $= 200\,KH_2 = 200{,}000\,H_2$
∴ The maximum data rate can be calculated
$N_{max} = 2 \times B \times n_b = 2 \times 200000 \times \log_2 4 = 8 \times 10^8$ bps
$= 800$ Kbps

Date: _____ (3)

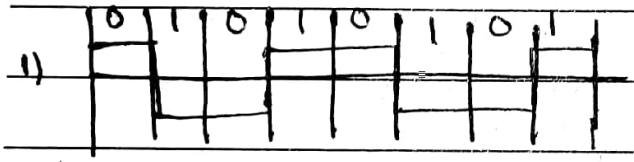
Question 2

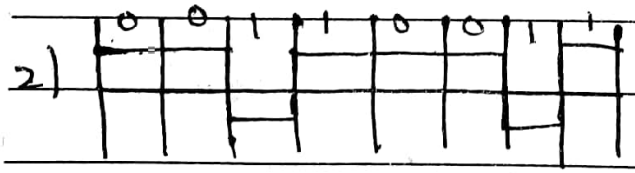
NRZ-L Scheme :-

1) 

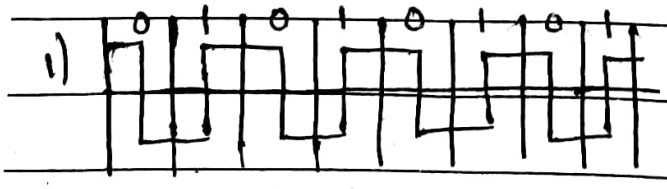
2) 

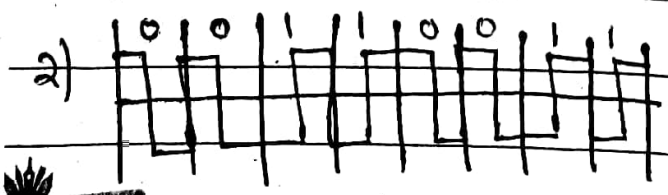
NRZ-I Scheme

1) 

2) 

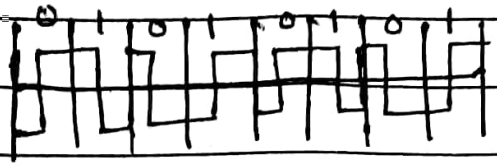
Manchester Scheme :-

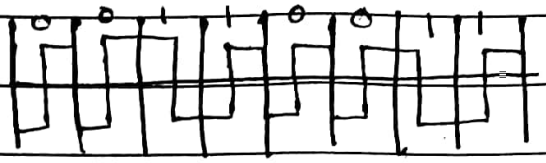
1) 

2) 

Date: _____ (4)

Differential Manchester Scheme:

1) 

2) 

Question 3

a)

Given Data:-

TV Channel bandwith (B) = 6MHz

Using 1st harmonic

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

Data rate = $2 \times B = 2 \times 6$

$= 12$ Mbps

~~For better results using 1st & 3rd harmonic~~

Date: _____ (5)

For better results using 1st to 3rd harmonics

$$\text{Data Rate} = \frac{2 \times B}{3}$$

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

$$= 4 \text{ Mbps}$$

Now, Using 1st & 5th harmonics

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

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

data rate = 2.4 Mbps

(2)

$$\text{Attenuation (dB)} = 10 \log_{10} B/n$$

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

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

$$= 10(-0.046)$$

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

Attainuation (dB) = -0.46 dB

(3) It is the reduction of strength in the power of signal due to external factors.

Its reduction is measured in decibel.

Given $P_s = 5W$

Attenuation $= -10db$

$\therefore \quad -10 = 10 \log_{10}(P_d/5)$

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

$P_d = 0.5W$

x ——— x ——— x

(4) The signal passed through 3 cascaded amplifier with each 4db gain.

Total gain $(P_{db}) = 3 \times 4 dB$

$P_{db} = 12 dB$

Signal Amplified

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

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

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

$P = [redacted]$

$P = 15.85$

(5) Bandwidth = 5Kbps
= 5000bps
(1Kbps = 1000 Kbps)

Time taken to send a frame 100,000 bits out of this device

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

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

x ——— x ——— x

(6)

Time taken by sunlight to reach earth = 8min

∴

8mins = 8x60s
= 480s

Converting miles per second to Km/s

$$= \frac{186000 \text{ miles}}{\text{sec}} \times \frac{1 \text{Km}}{0.62 \text{ miles}}$$

= 300,000 Km/sec

∴

the distance b/w sun & earth is

= 480 x 300,000
= 144,000,000 Km/s

Date:_____

Part (b) 3 :-

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

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

$$\text{Bit rate} = 500 \times \log_2 8$$

$$\text{Bit rate} = 1500$$