



INSTITUTE OF INFORMATION TECHNOLOGY
JAHANGIRNAGAR UNIVERSITY

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Question: 14

In a digital transmission the sender clock is 0.2 percent faster than the receiver clock. How many extra bits per second does the sender send if the data rate is 1Mbps?

Answer:

The number of bits is calculated as

$$= (0.2 / 100) \times 1$$

$$= 2000 \text{ bits}$$

Question: 15

Draw the graph of the NRZ-L scheme using each of the following data streams assuming that the last signal level has been positive. From the graphs guess the bandwidth for this scheme using the average number of changes in the signal level. Compare your guess with the corresponding entry in Table 4.1.

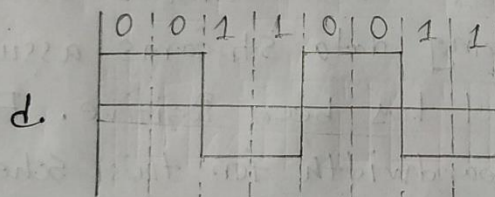
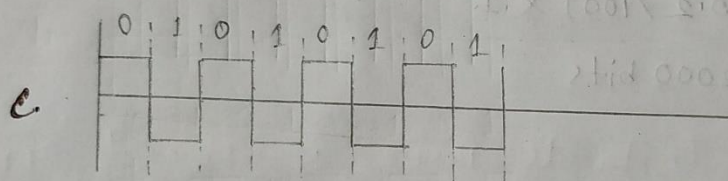
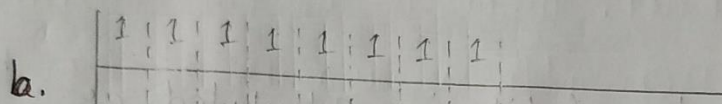
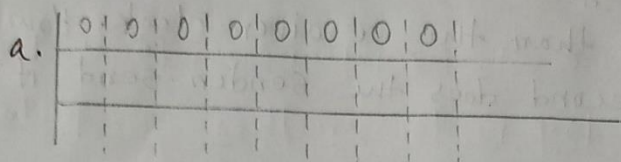
a. 00000000

b. 11111111

c. 01010101

d. 00110011

Answer:

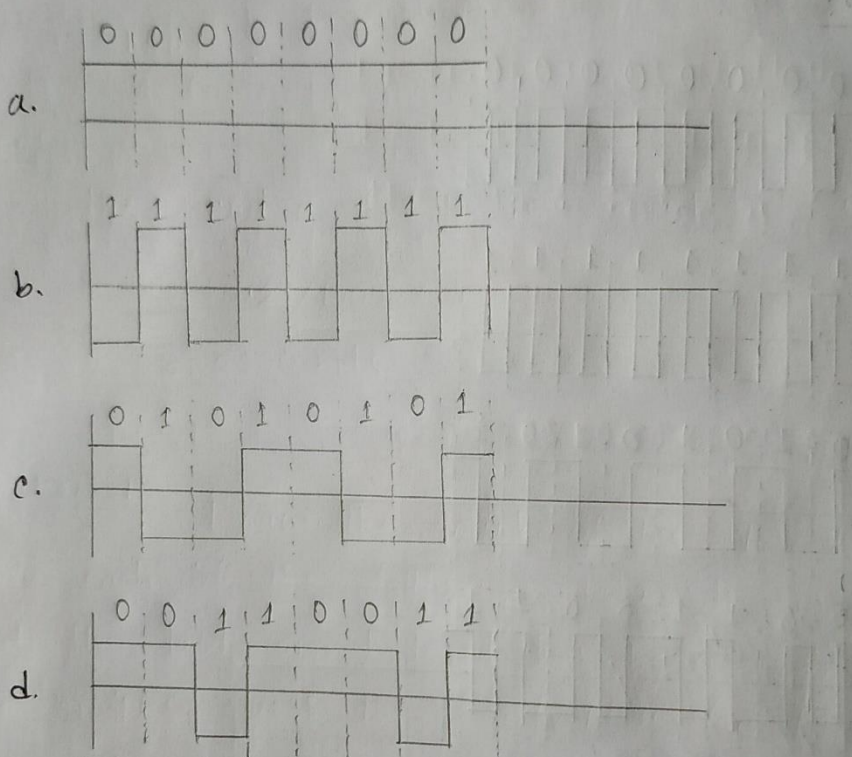


$$\begin{aligned} \text{Average Number of changes} &= (0+0+8+4)/4 \\ &= 12/4 \\ &= 3 \end{aligned}$$

Bandwidth is Proportional to $(3/8)N$ for $N=8$

Question 16. Repeat Exercise 15 for the NRZ-I Scheme.

Answer:



$$\text{Average Number of changes} = (0 + 9 + 4 + 4) / 4$$

$$= 17/4$$

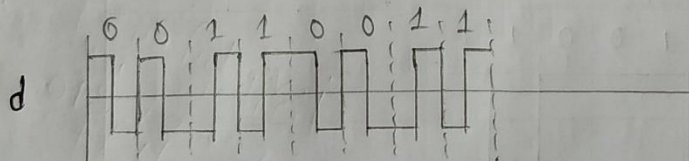
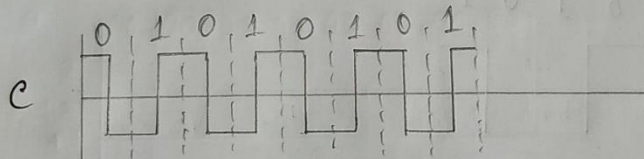
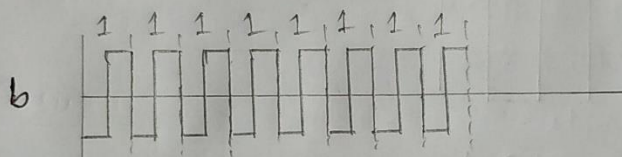
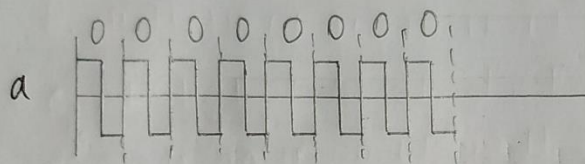
$$= 4.25$$

Bandwidth is Proportional to $(4.25/8)N$ for $N=8$

Question 17
Scheme

Repeat Exercise 15 for the Manchester

Answer:

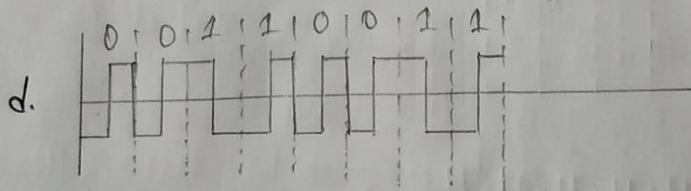
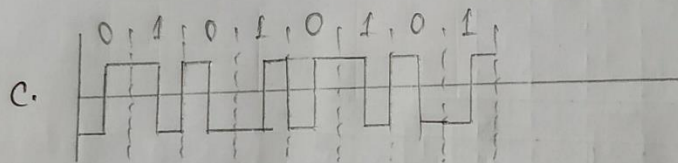
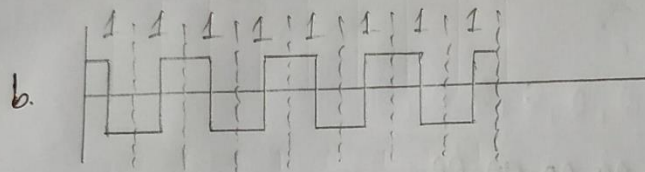
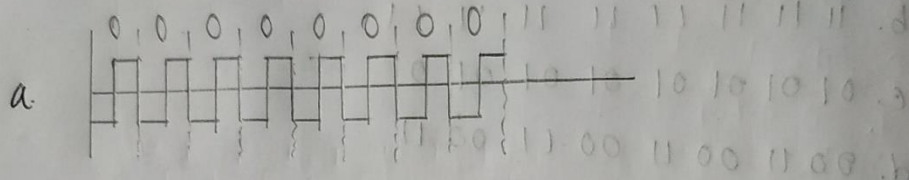


$$\text{Average Number of changes} = (15 + 15 + 8 + 12) / 4 = 12.5$$

Bandwidth is Proportional to $(12.5/8)N$ for $N=8$

Question 18 Repeat Exercise 15 for the differential Manchester scheme.

Answer.



$$\text{Average Number of changes} = (16 + 8 + 12 + 12) / 4 = 12$$

Bandwidth is Proportional to $(12/8)N$ for $N=8$

Question-19 Repeat Exercise 15 for the 2B1Q scheme but use the following data streams.

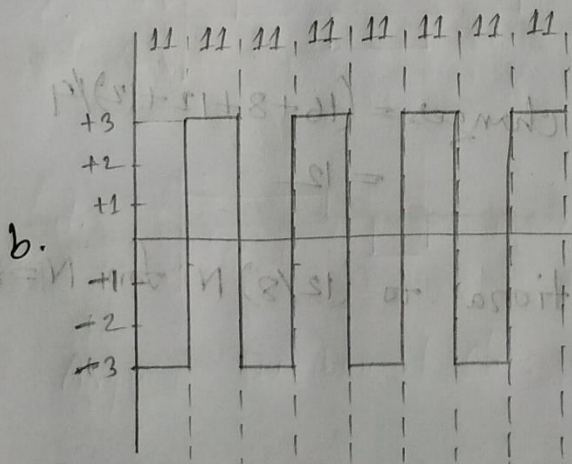
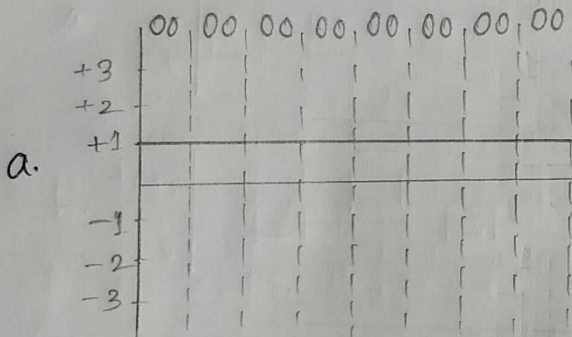
a. 00 00 00 00 00 00 00 00

b. 11 11 11 11 11 11 11 11

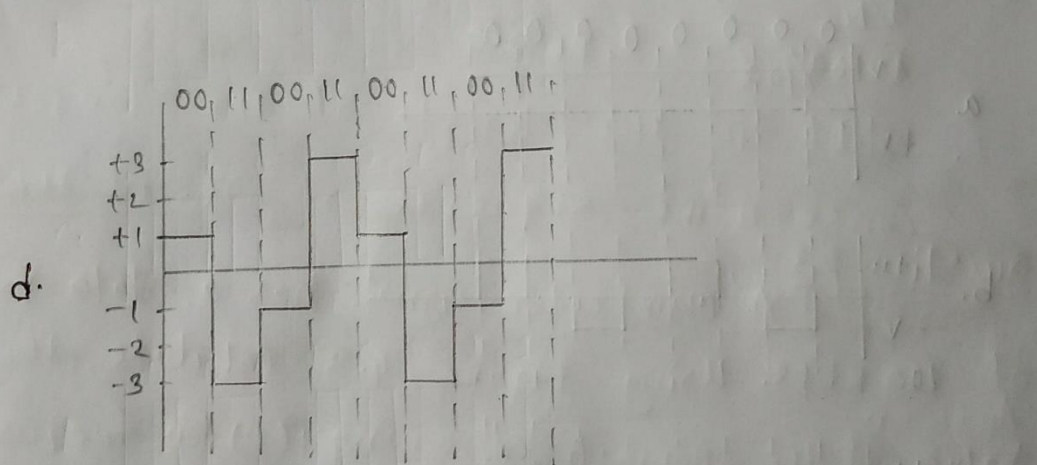
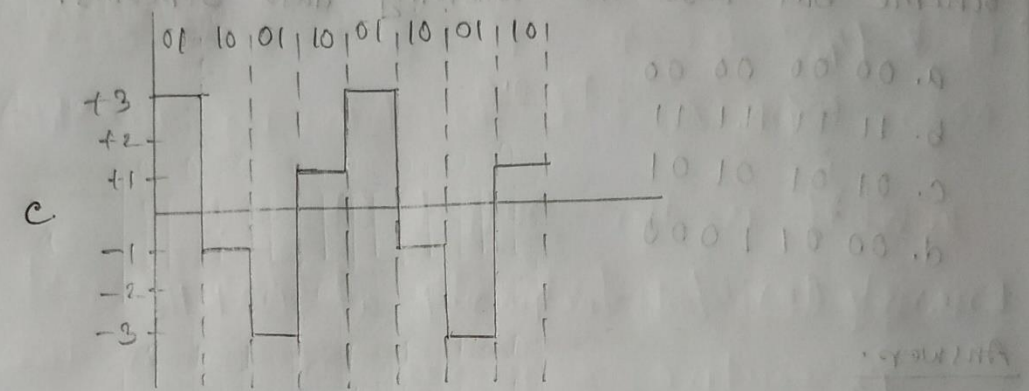
c. 01 01 01 01 01 01 01 01

d. 00 11 00 11 00 11 00 11

Answer:



Question 5: Repeat Exercise 4 for the following data stream.



Average Number of changes = $(0+7+7+7)/4$
 $= 5.25$

Bandwidth is proportional to $(5.25/16)N$ for $N=16$

Number of changes = $(0+7+7+7) = 21$

Question 20 Repeat Exercise 15 for the MLT-3 Scheme but use the following data streams.

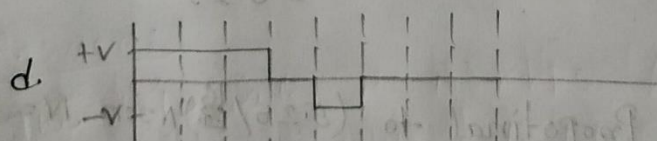
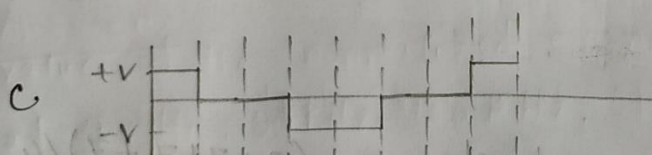
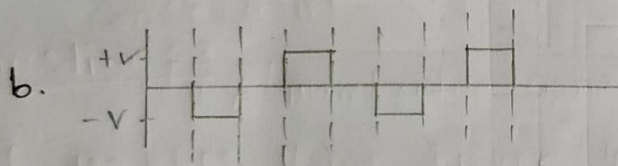
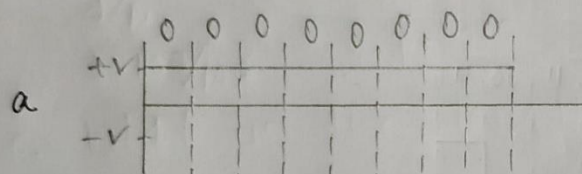
a. 00 00 00 00

b. 11 11 11 11

c. 01 01 01 01

d. 00 01 10 00

Answer:



$$\text{Average Number of changes} = (0 + 7 + 4 + 3) / 4$$

$$= 8.5$$

Bandwidth is Proportional to $(8.5/8)N$ for $N=8$

Question 21 Find the 8-bit data stream for each case depicted in Figure.

Answer.

a. NRZ-I : 10011001

b. Differential Manchester : 11000100

c. AMI : 01110001

Question 22 An NRZ-I signal has a data rate of 100 kbps. Using Figure 4.5 calculate the value of the normalized energy (P) for frequencies at 0 Hz, 50 Hz and 100 Hz.

Answer.

Given. The data rate is $N = 100$ kbps

energy (P) for frequency at 0 Hz

$$P = f/N \quad \therefore P = 1.0$$

$$= 0/100$$

$$= 0$$

Energy (P) for frequencies at 50 KHz

$$\begin{aligned} f/N &= 50/100 \\ &= \frac{1}{2} \end{aligned} \quad \therefore P = 0.5$$

Energy (P) for frequency at 100 KHz

$$\begin{aligned} f/N &= 100/100 \\ &= 1 \end{aligned} \quad \therefore P = 0.0$$

Question 23

A Manchester signal has a data rate of 100 kbps. Using Figure 4.8 calculate the value of the normalized energy (P) for frequencies at 0 Hz, 50 KHz, 100 KHz.

Answer:

The data rate is 100 kbps for each case we first need to calculate the value f/N .

We then use Figure 4.8 in the text to find P . All calculations are approximations.

for a frequency at 0 Hz

$$f/N = 0/100 \quad \therefore P = 0.0$$

for a frequency at 50 KHz

$$f/N = 50/100 \quad \therefore P = 0.3$$

$$= \frac{1}{2}$$

for a frequency at 100 KHz

$$f/N = 100/100 \quad \therefore P = 0.4$$

$$= 1$$

Question 24 the input stream to a 4B/5B block encoder is 0100 0000 0000 0000 0000 0001. Answer the following question.

- What is the output stream?
- What is the length of the longest consecutive sequence of 0s in the input?
- What is the length of the longest consecutive sequence of 0s in the output?

Answer:

a. The Output Stream is 01010 11110 11110 11110 11110 01001

b. The maximum length of the consecutive 0s in the input stream is 21.

c. The maximum length of the consecutive 0s in the output stream is 2.

The End