COMMUNICATION PROTOCOLS

SECTION 2 QUESTION 1 INTRODUCTION

Consider the transmission of a 50-bit long information sequence, according to the following communication protocol:

- The information bits to be transmitted are broken into 4-bit data blocks.
- If not enough bits are available to fill a complete block, zero padding is applied.
- One start bit (value 1) and one stop bit (value 0) is added to each block to make a complete frame.
- Frames are concatenated one after the other with no delay between them.
- The bit stream is converted into a waveform by holding each bit for SPB = 3 samples.
- The waveform is transmitted using a sample frequency of 1M samples per second.

SECTION 2 QUESTION 1 PART A (2/2 points)

How many data blocks are needed to transmit the information sequence?

Please key in the numerical value of your answer in the box provided below.

13

13

Show Answer *You have used 1 of 1 submissions*

SECTION 2 QUESTION 1 PART B (2/2 points)

How long (in bits) is the bit sequence containing the frames that hold the information sequence?

Please key in the numerical value of your answer in the box provided below.

78

78

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SECTION 2 QUESTION 1 PART C (2/2 points)

How long (in microseconds) would it take to transmit the bit sequence containing the frames?

Please key in the numerical value of your answer in the box provided below.

234

234

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SECTION 2 QUESTION 1 PART D (2/2 points)

Suppose that the frames are transmitted asynchronously, so that there may exist delays between adjacent frames. Assume that the receiver uses the same sample frequency as the transmitter, that when the channel is idle or the transmitter is transmitting a 0 bit, the received voltage is 0V, and that when the transmitter is transmitting a 1 bit, the received voltage is 1V. What was the original information sequence (before framing) if we receive the following sequence of samples (in Volts)?

000000011111100011100000000011100011111100000001110001111111000000000

Please key in the numerical value of your answer in the box provided below. Input the bit sequence in series of 1's and 0's with no spaces between. (e.g. 0101...)

101001100111

101001100111

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SECTION 2 QUESTION 2 (2 points possible)

In the RS232 communication protocol used for asynchronous communication, once the receiver has identified the start bit of a frame, how does it determine when to stop receiving data for that frame?

- It looks for the start bit of the next frame, whose value is determined by the communication protocol.
- It looks for the stop bit, whose value is determined by the communication protocol. ✗
- It stops after receiving a fixed number of bits, which has been determined by the communication protocol. ✓
- It uses zero padding, where the number of zeros to be padded has been determined by the communication protocol.

Help

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SECTION 2 QUESTION 3 (2 points possible)

Suppose that there is a mismatch between the communication protocol used by the transmitter and the receiver. The transmitter transmits bits with 50 samples per bit, while the receiver assumes 35 samples per bit. Assume that
1. The transmitter and receiver use the same sampling frequency.
2. The receiver makes bit decisions at the end of each bit time.
3. The effect of intersymbol interference is negligible.
4. Data is being transmitted in frames, with a single start bit, a data block of 8 bits and no stop bits.
5. The receiver can reliably identify the beginning of each start bit.
6. There is no additive noise in the channel.

Which of the following is correct.

- All received data bits may have errors. ✗
- All data bits will be received correctly.
- The first data bit will be received correctly, but the rest may have errors.
- The first two data bits will be received correctly, but the rest may have errors. ✓

EXPLANATION

Hide Answer *You have used 1 of 1 submissions*

SECTION 2 MATLAB QUESTION (3/3 points)

In this MATLAB question, you will implement framing of a random 18-bit sequence according to the following communication protocol.

1. The information bits to be transmitted are broken into 4-bit blocks. If not enough bits are available to fill a complete block, zero padding is applied.

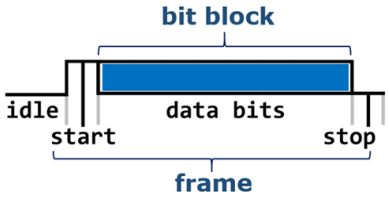
2. One start bit (value 1) and one stop bit (value 0) is added to each block to make a complete frame.

3. Frames are transmitted one after the other without any delay between.

The available code generates a 18-bit long random bit sequence stored in **bs**. Your job is to generate the bit stream after framing, and store it in the MATLAB variable **framed_bs**.

When you run the code, MATLAB will return a figure window with two subplots: the top containing the original bit sequence **bs** and the bottom containing the bit stream after framing **framed_bs**.

Help

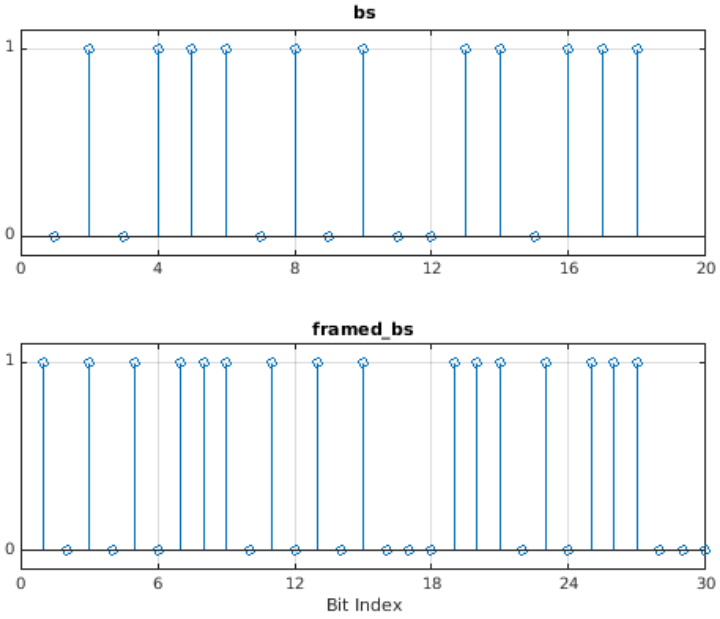



```
% generate a 18-bit long random sequence
% do not modify the value of bs
bs = rand(1,18)>0.5;

% Modify the code below so that framed_bs contains the bit stream after
% framing following the communication protocol described above.
%framed_bs = bs;
%len_bs = length(bs);
%num_blocks = round(len_bs / 4);

%if (mod(len_bs,4))
    %num_blocks = round(num_blocks + 1);
%end

%numBitsPerFrame = 6; %4 bits per block plus 1 start and 1 stop bit
```

Correct

```
bs_padded = [bs zeros(1,4-rem(length(bs),4))];
nblock = length(bs_padded)/4;
framed_bs = [ones(1,nblock);
             reshape(bs_padded,4,nblock);
             zeros(1,nblock)];
framed_bs = framed_bs(:)';
```

Figure 1



Help

Hide Answer

You have used 1 of 5 submissions