

Question 1

6 marks

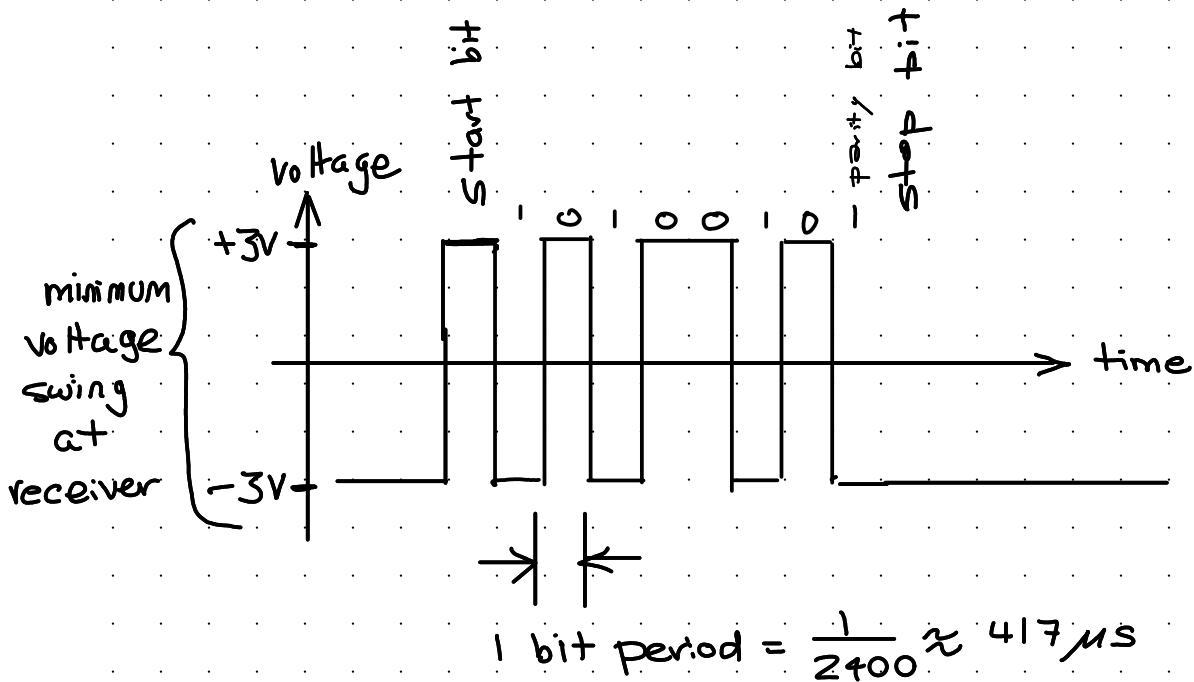
Draw the waveform that would be used by a typical asynchronous serial ("RS-232") interface to transmit the 7-bit value 0x25 at 2400 bps using 7 bits per character and even parity.

Label the voltage axis. Draw the waveform using the minimum valid voltages at the receiver. Label the duration of one bit in units of microseconds.

$$0x25 = \underbrace{0010}_2 \underbrace{0101}_5$$

number of 1's = 3 (odd)  
for even parity add a '1'

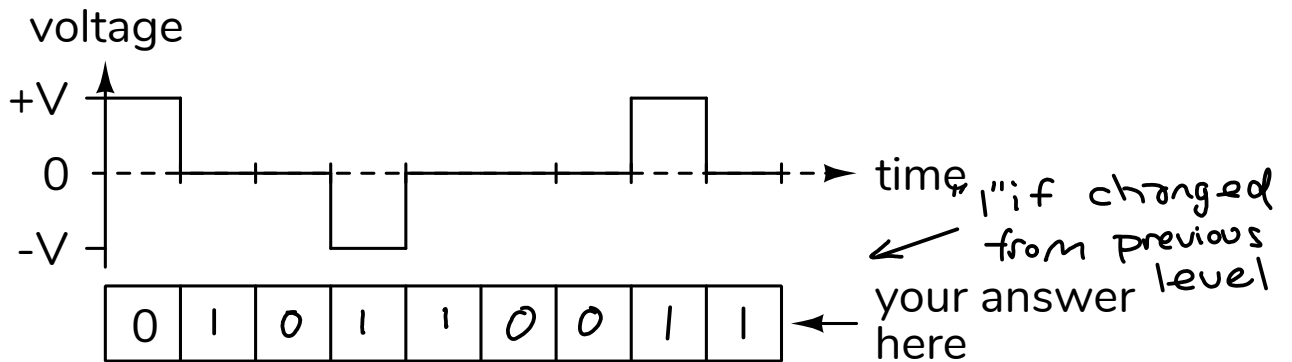
1sbit first: 1010010 ← parity bit



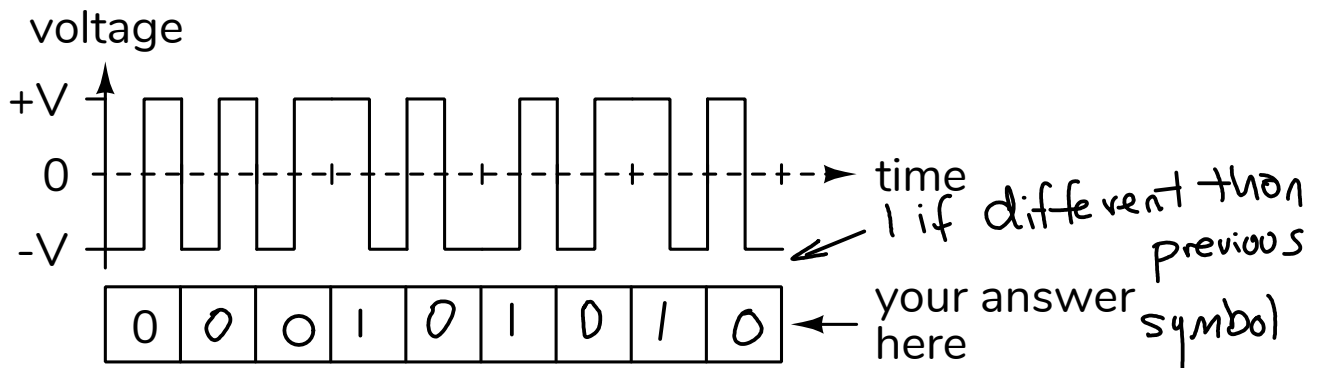
Question 2

8 marks

- (a) The diagram below shows a data signal encoded using the MLT-3 line code. Fill in the boxes with the bit values that were being transmitted in each time interval.



- (b) The diagram below shows a data signal encoded using a differential Manchester line code following the conventions in the lecture notes. Fill in the boxes with the bit values that were being transmitted in each time interval.



Question 1

6 marks

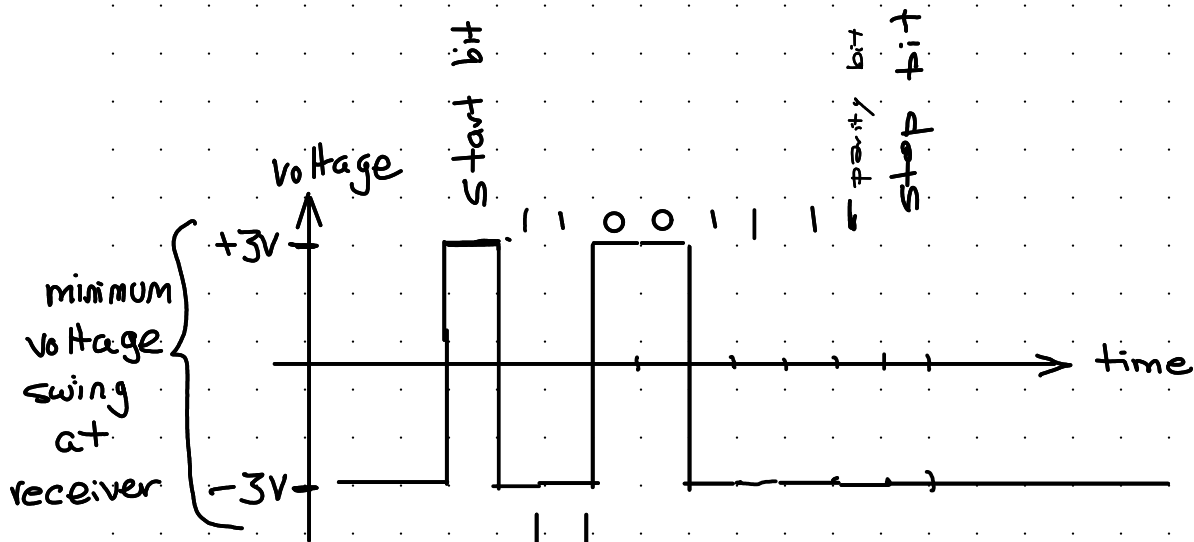
Draw the waveform that would be used by a typical asynchronous serial ("RS-232") interface to transmit the 7-bit value 0x73 at 9600 bps using 7 bits per character and even parity.

Label the voltage axis. Draw the waveform using the minimum valid voltages at the receiver. Label the duration of one bit in units of microseconds.

$$0x73 = \underbrace{0111}_{7 \text{ bits}} \underbrace{0011}_{3 \text{ bits}}$$

number of 1's = 5 (odd)  
for even parity add a '1'

1sbit first: 1100111 ← parity bit

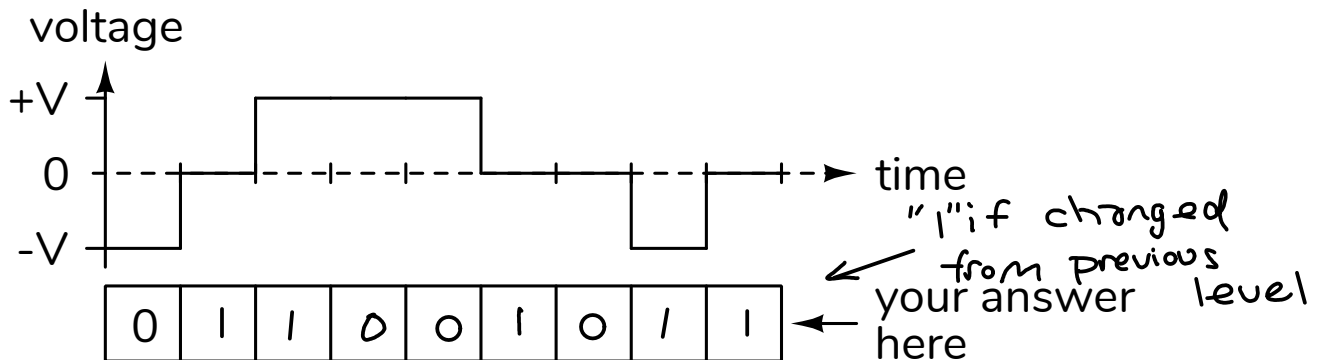


$$1 \text{ bit period} = \frac{1}{9600} \approx 104 \mu\text{s}$$

Question 2

8 marks

- (a) The diagram below shows a data signal encoded using the MLT-3 line code. Fill in the boxes with the bit values that were being transmitted in each time interval.



- (b) The diagram below shows a data signal encoded using a *differential* Manchester line code following the conventions in the lecture notes. Fill in the boxes with the bit values that were being transmitted in each time interval.

