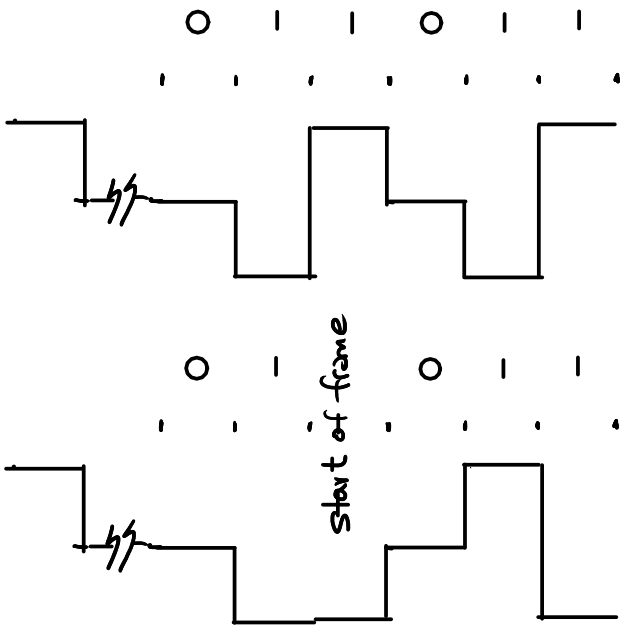
Framing

Exercise 1: Draw the waveform for an AMI-NRZ encoded sequence of bits '011011' assuming the previous mark was transmitted as a positive pulse. Draw the waveform assuming the second '1' indicates the start of a frame.



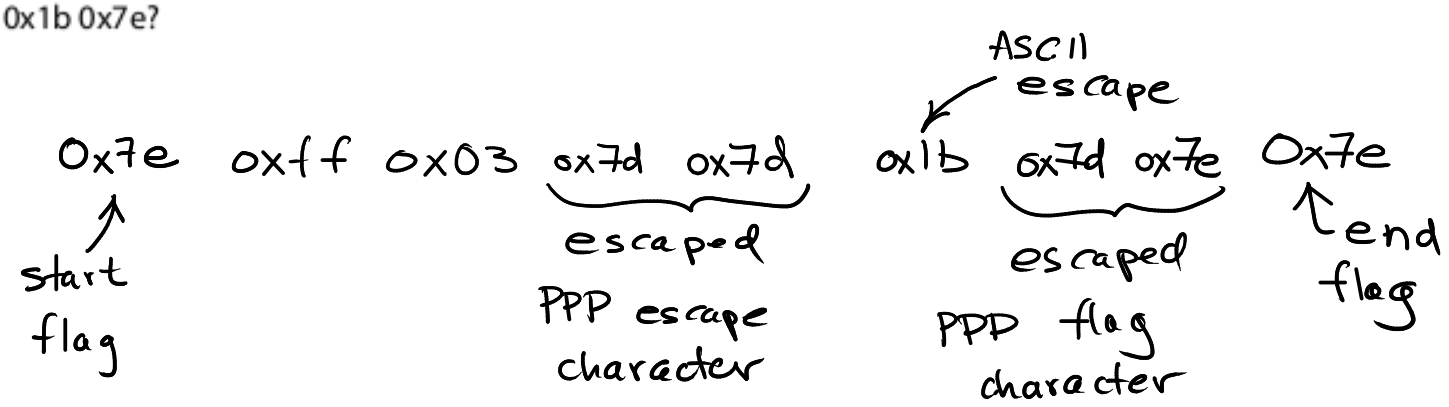
Exercise 2: Preambles such as this allow multiple transmission standards to co-exist on the same channel. What might be some advantages of this? What might be some disadvantages of using such a preamble?

- advantages
  - can introduce new frame formats that older devices ignore
  - easier synchronization
- disadvantages
  - overhead (longer packet duration)

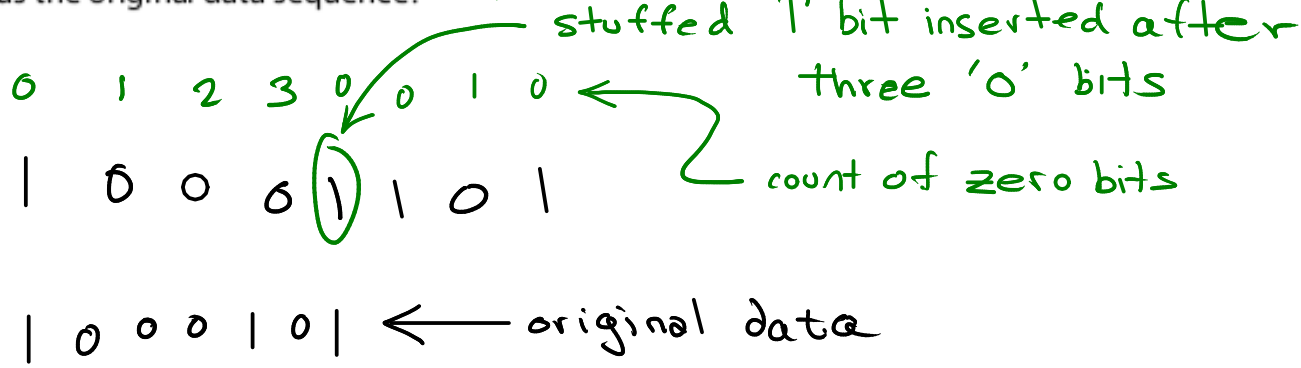
Exercise 3: By how much does the use of escape characters slow down a link transmitting a continuous stream of escape characters?

- each escape character is sent as two characters ∴ throughput is reduced by $\frac{1}{2}$.

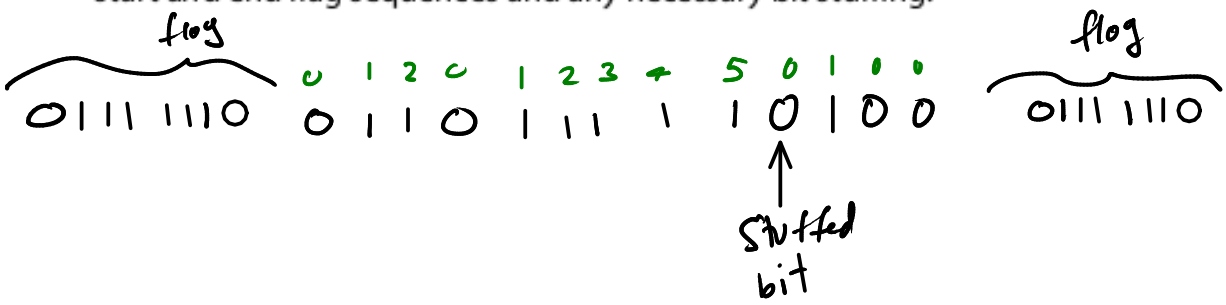
Exercise 4: What sequence of bytes would be sent to transmit a PPP-encapsulated frame containing the bytes 0xff 0x03 0x7d 0x1b 0x7e?



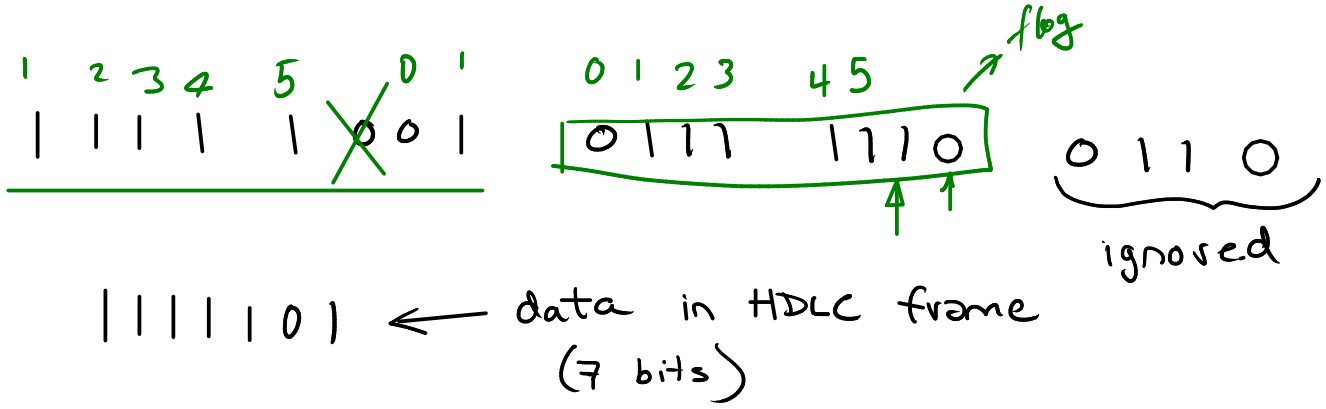
Exercise 5: You receive the sequence of bits 10001101 and are told that bit stuffing was used to limit runs of 0 to three or fewer. What was the original data sequence?



Exercise 6: Write out the complete sequence of 1's and 0's required to transmit the 12 bits 0110 1111 1100. Include the start and end flag sequences and any necessary bit stuffing.



Exercise 7: An HDLC receiver sees the sequence 1000 0111 1110 1111 1001 0111 1110 0110. What data bits were contained within the frame?



Exercise 8: A physical layer transmits 3 bits per symbol. A frame of 128 bytes is being transmitted. How many padding bits will have to be added to the frame?

128 bytes grouped into 3 bits/symbol

how many symbols? $\frac{128 \times 8}{3} = \frac{1024}{3} = 341.33$ ← can't have 1/3 symbol

so... round up to 342 symbols.

pad bits = bits sent − data bits

$= 342 \times 3 - 128 \times 8 = 1026 - 1024 = 2$ pad bits.