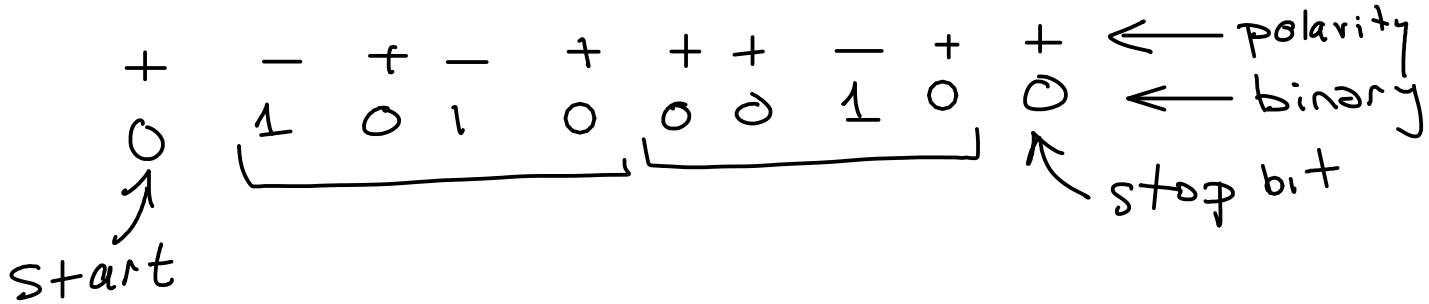
ELEX 3525 Mid Term Exam Solutions

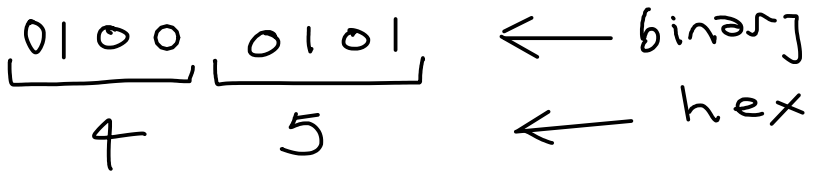
Spring Term 2014

Q.1

(a) The bits transmitted are, in order from LS to MS bit:



in order from MS to L.S. bit:



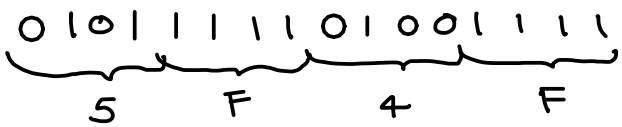
Looking this up in an ASCII table shows that 0x45 is the character 'E'.

(b) The bit rate is the inverse of the bit duration, $f_{bit} = \frac{1}{1ms} = 1\,kHz$.

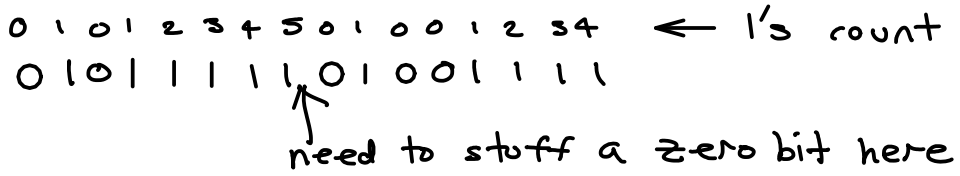
The baud rate is the maximum number of transitions per second, also 1kHz.

(c) The signal levels must be $> \pm 3V$ to be valid, so yes, these are valid signal levels. (they are also less than the maximum levels which vary).

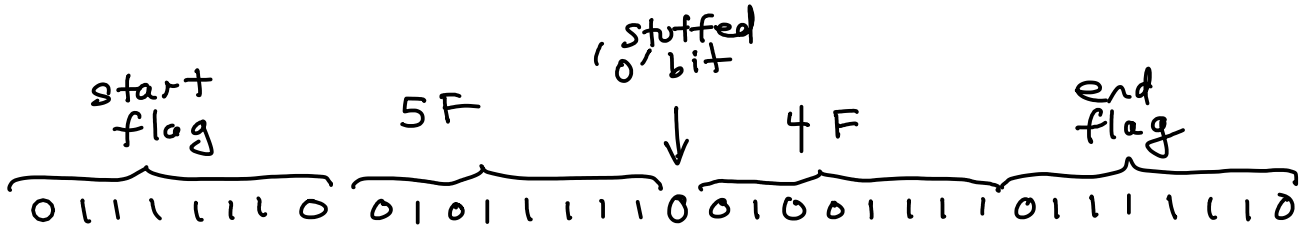
Q. 2 The bits in the bytes 0x5F 0x4F in order from MS to LS bit are



For HDLC framing we need to add flags (0111 1110) at the start and end and also "bit-stuff" a zero after 5 consecutive '1' bits to 'escape' possible embedded flag sequences.



∴ the HDLC frame would be:



Q. 3

(a) The first channel has symmetry about $f = 500$ kHz so the Nyquist rate would be 1 MHz, and we could transmit (impulses) at 1 MHz without ISI.

The second channel also has symmetry about 500 kHz so it could pass the same symbol rate without ISI.

(b) The first channel has an excess bandwidth parameter > 0 ($\alpha \approx 2/3$), while $\alpha = 0$ for the second channel.

Larger values of α result in wider eye openings and less sensitivity to timing errors (Lecture 5, pp. 2 & 3).