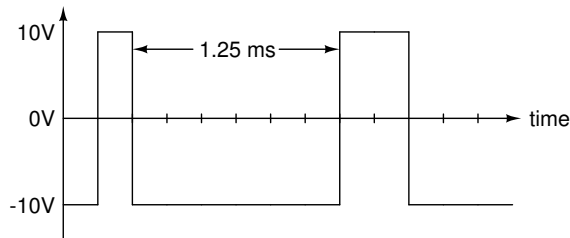


Solutions to Midterm Exam 1

Question 1

There were two versions of this question.

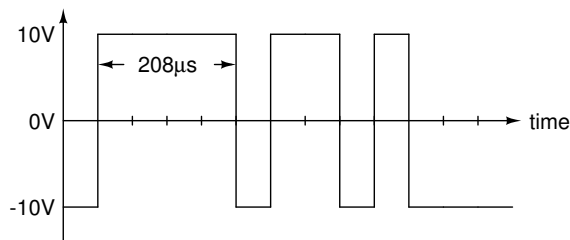
In the following diagram, the duration of each bit is $\frac{1250}{6} = 208 \mu\text{s}$ so the bit rate is 4800 bps.



Ignoring the initial start bit, the 7 data bits, from MS to LS bit (reading right to left) are: **011 1111** and the parity bit is **0** (high). The value in hex is **0x3F**. From table C0 of the Unicode standards (which contains the ASCII characters) this is a question mark (?).

Including the parity bit there are 6 '1' bits so even parity was used.

In the following diagram, the duration of each bit is $\frac{208}{4} = 52 \mu\text{s}$ so the bit rate is 19.2 kbps.



Ignoring the initial start bit, the 8 data bits, from MS to LS bit (reading right to left) are: **0100 1000** and the parity bit is **1** (low). The value in hex is **0x48**. From table C0 of the Unicode standards (which contains the ASCII characters) this is the capital letter H (H).

Including the parity bit there are 3 '1' bits so odd parity was used.

Question 2

The Unicode codepoint for the White Smiling Face (😊) Emoji is **U+263A** and for the Alarm Clock (🕒) Emoji it is **U+23F0**.

- Unicode standard Table 3-6 shows the UTF-8 encoding for these values must be encoded using the third row of the table and requires three (3) bytes.
- The binary representation of **0x263A** is **0010 0110 0011 1010** from which $z=0010$, $y=0110$ **00**, $x=11$ **1010**, and the three bytes are: **1110 0010**, **10 0110 00**, **10 11 1010** which are **E2**, **98**, and **BA** in hex.

The binary representation of **0x23F0** is **0010 0011 1111 0000** from which $z=0010$, $y=0011$ **11**, $x=11$ **0000**, and the three bytes are: **1110 0010**, **10 0011 11**, **10 11 0000** which are **E2**, **8F** and **B0** hex.