Pre-lab Assignment 10

Due: Sat, 14 Nov 2020 23:59:59 (approximately 26 days ago)
[Score: 22 / 25 points possible]

The following questions should prepare you for a lab about the Universal Synchronous/Asynchronous Receiver/Transmitter (USART) interface hardware found in the STM32.

Academic Integrity Statement [0 ... -100 points]

By typing my name, below, I hereby certify that the work on this prelab is my own and that I have not copied the work of any other student (past or present) while completing it. I understand that if I fail to honor this agreement, I will receive a score of zero for the lab, a one letter drop in my final course grade, and be subject to possible disciplinary action.

| Raghuram Selvaraj | ✓ |

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(1) [1 point]

When the transmitter of either the STM32 USART or the FTDI232 is idle, in what state is the wire to which it is connected held at? (i.e., what voltage or logic level is it?)

| High | ✓ |

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(2) [1 point]

What is the maximum configurable clock rate of your STM32's SPI peripheral?

| 24 MHz | ✓ |

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(3) [1 point]

What was the clock rate of the I2C communication link in last weeks' lab?

| 24 MHz | ✗ |

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(4) [1 point]

What baud rate will be used for this week's asynchronous serial communication? (You'll have to wait until the lab is released to answer this one.)

115200 baud ✓

(5) [1 point]

What does the beginning of the serial start bit look like? In other words, it's a transition. What kind of transition is it?

falling edge, high to low ✓

(6) [1 point]

What are the voltage levels for an RS-232 communication line? Note that this is entirely different from the voltages used by the FTDI232 and STM32.

high: +3V to +15V; low: -15V to -3V ✓

(7) [1 point]

What is the (recommended) maximum length of an RS-232 connection?

15 m ✓

(8) [1 point]

Would either SPI or I2C be better than RS-232 for a connection of the length you specified in question (7)? Why or why not?

SPI's max length 10m and I2C's max length is 1m, so no. ✓

(9) [1 point]

Which bit of a data byte is sent first in standard asynchronous serial communication?

least significant bit

(10) [1 point]

What does the term "odd parity" mean?

all of the 1 bits added to the parity bit must be an odd number

(11) [1 point]

Write the parity bit for the following 8-bit word so it satisfies an even parity scheme: 10101110

1

(12) [1 point]

When a 38,400 baud serial channel uses 1 start bit, an 8-bit word, no parity, and 1 stop bits, approximately how many bytes of useful information can it transmit per second?

480

(13) [1 point]

What does a stop bit look like?

high signal

(14) [1 point]

If a receiver is configured to expect 1 stop bit, but it receives 2 stop bits, what problem, if any will occur? I.e., why is or is this not a problem?

standard serial protocol states that a stop bit can be 2 bits long

(15) [1 point]

What is a framing error?

| If a stop bit is not seen where it is expected | ✓ |

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(16) [1 point]

What are common reasons for a framing error?

| disagreement in packet format, clock rates running too far out of tolerances | ✓ |

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(17) [1 point]

What is an overrun error?

| receiver wasn't able to read a new byte before another one starts shifting in | ✓ |

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(18) [1 point]

What are the common reasons for an overrun error?

| system is too slow to read bytes in time | ✓ |

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(19) [1 point]

According to the RS-232 specificaiton, how close to a receiving UART's baud rate be to a transmitter's baud rate in order to properly receive each word?

| 5% difference | ✓ |

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(20) [1 point]

What value would you store in the BRR register of the STM32's USART peripheral to configure 31,000 baud communication using a 48MHz clock with 16x oversampling? (You'll have to calculate it. You won't find it in the baud rate table, but you can use that to check if you're close.) You can express your answer as a decimal

number. Choose a BRR value that produces a baud rate as close as possible to the one desired. (Remember that it does not need to match exactly.)

0x4e2   ❌

(21) [1 point]

What bit in the USART ISR must be checked to determine if the transmitter is ready to be given a new byte to send?

USART_ISR_TXE   ✓

(22) [1 point]

What bit in the USART ISR must be checked to determine if there is a newly-received byte to be read?

USART_ISR_RXNE   ✓

(23) [1 point]

How is the framing error flag cleared?

set FECF bit in USARTx_ICR   ✓

(24) [1 point]

How is the RXNE flag cleared?

read USARTx_RDR or set RXFRQ bit in USARTx_RQR   ✓

(25) [1 point]

How is the TXE flag cleared?

write to USARTx_TDR or set TXFRQ bit in USARTx_RQR   ✓