Assignment 8 - Serial and Parallel Interfaces

Due November 16, 1995

Question 1

Draw the waveform used for serial transmission of the ASCII character `R` at 9600 bps with 8 data bits and no parity. Label the time and voltage axes.

Question 2

You are trying to figure out why one computer won't send data to another. You measure the RTS pin on the computer and find it is putting out +5 volts. Is this computer wired up as a DTE or DCE? You check the other computer's interface and its DTR pin is at +9 volts. What is likely the cause of the problem? How could it be resolved?

Question 3

The following sequence of bits contains two HDLC frame sync sequences framing a number of bits. List the data bits contained within the frame. Group the bits into sets of 4 from left to right and give the corresponding hexadecimal digits (pad with zero).

```
0111 1110 1011 1010 1111 1011 0011 1111 0000
```

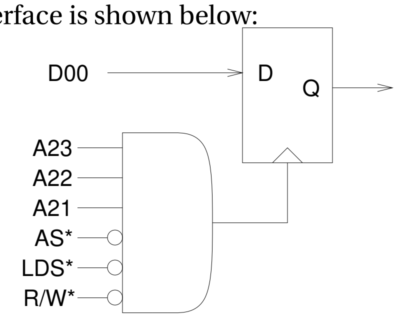
Question 4

Consider the following software timing loop for a 68000. What is the total delay as a function of the value of the constant DLY? Assume an 8 MHz 68000 and include delays due to all of the instructions shown.

```
        MOVE.L  #DLY,D0
        JSR     DELAY    * assume 32-bit operand
        ...
DELAY:  SUBQ.L  #1,D0
        BNE.S   DELAY    * uses 8-bit displacement
        RTS
```

What value of `DLY` would produce a delay closest to *half* a bit period at 9600 bps? What is the percentage error? How could you reduce the absolute error to $\leq 0.5\mu$s?

Write a 68000 assembly language subroutine that transmits a byte in asynchronous serial format using a one-bit parallel interface. The character format should be: one start bit, 8 data bits, no parity and one stop bit. The byte to be transmitted is in D1 When the subroutine is called. The subroutine should call the function above to produce the required delays. The routine need not preserve any registers. Submit a listing of the source code for your program (not a disk). The schematic of the parallel interface is shown below:



Assume that a high signal level on the flip-flop output produces -5 volts on the RS-232 data line.

Question 5

A "Centronics-compatible" printer output port is implemented as an 8-bit output port at address \$FE0000, a 1-bit (only LS bit connected) output port at \$FE0001 connected to STROBE*, and a 1-bit (only LS bit connected) input port at \$FE0000 connected to BUSY. Draw a schematic of a suitable circuit for a 68000 system using gates and D flip-flops.

Write a 68000 assembly-language program to output a character over this port. The routine should wait until the printer is ready (not busy). It should then write the data value and generate the correct strobe signal. Assume that a '1' read/written from/to a port corresponds to a high signal level. The STROBE* width should be at least 2 microseconds (assume an 8 MHz 68000). The routine need not preserve any registers. Submit a listing of the source code for your program (not a disk).