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EL308

Sample Questions for the Final
and answers

Spring 2008-2009

1. Suppose that a particular member of the PIC 24 family does not have an UART. How would you use one port bit (such as RA0) to transmit a byte of information (contained in the low byte of W0) in RS-232 standard using the following settings: 9600 BAUD, no parity, one stop bit?

ANSWER: ; set PORTA #0 as output

bclr LATA, #0 ; start bit
call wait_1_period ; subroutine for a 1/9600 sec. delay
mov #8, W1

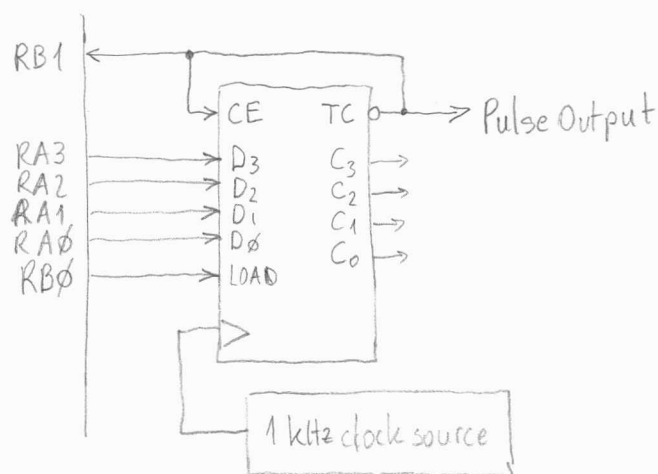
data_loop:

mov W0, PORTA
call wait_1_period
sar W0, #1, W0
dec W1, W1
bra NZ, data_loop

bset LATA, #0 ; stop bit
call wait_1_period

QUESTION: How would you write the "wait_1_period" subroutine?

2. A 4-bit synchronous binary down counter with parallel load, count enable and terminal count (i.e., count = 0) output is connected to a microcontroller as shown in the figure. How can you use this circuit to generate a pulse of 6 msec length? (When LOAD = 1, the counter loads the number at the D₀-D₃ inputs).



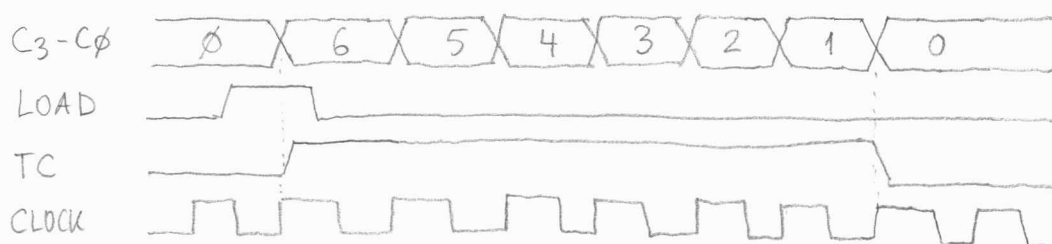
② ANSWER

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mov #6, W0  
mov W0, PORTA  
bset PORTB, #0 ; enable load
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wait-load:

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btss PORTB, #1 ; is the number loaded (i.e, TC=1?)  
bra wait-load  
bclr PORTB, #0 ; disable load
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Time waveforms:



3. The analog input voltage applied to an 8-bit ADC with 5.0 Volts full conversion range is 4.15 volts. Write down inputs applied to the DAC at each conversion clock period. What is the ADC result?

ANSWER :

DAC = 1000 0000	V _{out} = 2.5 V	Comparator = 1
DAC = 1100 0000	V _{out} = 3.75 V	Comparator = 1
DAC = 1110 0000	V _{out} = 4.375 V	Comparator = 0
DAC = 110 10000	V _{out} = 4.0625 V	Comparator = 1
DAC = 11 011000	V _{out} = 4.21875 V	Comparator = 0
DAC = 11 010100	V _{out} = 4.140625 V	Comparator = 1
DAC = 11 010110	V _{out} = 4.1796875 V	Comparator = 0
DAC = 11 010101	V _{out} = 4.16015625 V	Comparator = 0

ADC result = 11010100

4. The RS232 protocol allows the transmission and reception of a parity bit, which might be used to identify an incorrect byte. However, the protocol does not have a mechanism to request the retransmission of a byte. How can you implement this under software control?

ANSWER : There are many ways. You may consider sending back an ACK byte to the source. If the received byte is not acknowledged, the source may retransmit the incorrect byte. Or, you may think of sending back an error report after the reception of a certain number of bytes.