

CE351 In-Class Exercise 2 (18 points)

1. Assuming a music note is 800 Hz, what is the period in ms? What is its half period? What is the number of Timer counts until it toggles the pin that generates this sound? (assuming 1:1 pre scaler, 16 MHz). (3 points)

2. For the ATMEGA2560 chip, which timers are 8-bit which timers are 16-bit? (2 points)

3. What is TCCR1B? (1 point)

4. What are the lower three bits do in TCCR1B? (1 point)

5. What is TIFR1? What is TOV1? Where is TOV1 in TIFR1? (3 points)

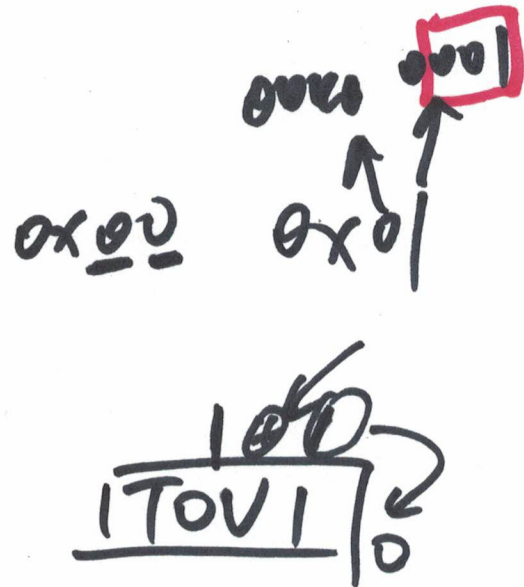
6. What is TCNT1? Why there is a TCNT1H and TCNT1L? (2 points)

7. How to reset TOV1? (1 point)

8. How long it takes to roll over the TIMER 1 if it starts at 0x0000 and 0xADAB? (1:1 prescaler). Please display the expression and the final calculated results. (2 points)

9. Same question as Problem 8 but change it to 1:256 prescaler. (2 points)

10. What the counts would be after 2ms you turn on Timer 1? (1:1 prescaler) (1 point)



8-bit

16-bit

CE351 In-Class Exercise 3 (7 points)

Timers 0, 2

Timers 1, 3, 4, 5

Notes:

TENT1

- 16,000,000 counts/s, 2^{16} counts takes $2^{16}/16,000,000 = 4.1$ ms
- Every 1ms has $0.001 * 16,000,000 = 16,000$ counts
- Every count takes $1/16,000,000 = 62.5$ ns

Questions:

0.001s. $16M \frac{\text{counts}}{s} \times 1:8 = 16000$

$\frac{2^{16} \text{ counts}}{16M \frac{\text{counts}}{s}} = 4.1 \text{ ms}$

1. How much time goes by in 30,000 counts? (1:1 prescaler)

$\frac{30000 \text{ counts}}{16 \cdot 10^6 \frac{\text{counts}}{s}} =$

$2^{16} = 65536$

2. Starting at 30,000, how long will it take Timer1 to roll-over? (1:1 prescaler)



$\frac{2^{16} - 30000}{16 \cdot 10^6} =$

1:8 :
30000
 $\frac{16 \cdot 10^6 \text{ counts}}{8 \text{ s}}$

3. What starting value would result in Timer1 rolling over in 3ms? (1:1 prescaler)



$\frac{2^{16} - X}{16 \cdot 10^6} = 3 \cdot 10^{-3}$

4. How many Timer1 counts occur in 1.5ms? (1:1 prescaler)

$1.5 \cdot 10^{-3} \text{ s} \cdot 16 \cdot 10^6 \frac{\text{counts}}{s} =$

5. How many times would Timer1 rollover in 100 seconds? (1:1 prescaler)

$\frac{100 \text{ s}}{\frac{2^{16} \text{ counts}}{16 \cdot 10^6 \frac{\text{counts}}{s}}} \approx 4444.04$

6. Starting at 0, what value would be stored in Timer1 after 10ms? (1:1 prescaler)

$\frac{10 \times 10^{-3}}{\frac{2^{16}}{16 \cdot 10^6}} \approx 2.6$

$10\% \cdot 2^{16} =$ []

7. Assume that the counter is currently at 0xABCD, how long will it take for the counter to reach 0x1234. (1:1 prescaler)

