Solutions - Quiz 3

(November 11th @ 5:30 pm)

PROBLEM 1 (20 PTS)

- Mark the correct option:
  - ✓ The address where the Interrupt Vector is located is called: **Vector Address** Return Address
  - ✓ The Real-Time Interrupt is a: **Maskable Interrupt** Non-maskable Interrupt
- Complete:
  - ✓ The Starting address of an Interrupt Service Routine is called __Interrupt Vector_____
- HCS12 Timer: Briefly describe the following functions:
  - ✓ Input Capture Function:
    Whenever an event is present on an Input Capture pin, the value of the Timer Counter (TCNT) is loaded on the respective Input Capture Register.
  - ✓ Output Compare Function:
    The user places a value on an Output Compare Register. When the Timer Counter (TCNT) value equals that value, n event (to high, to low, to toggle) is triggered on the respective Output Compare pin.

PROBLEM 2 (50 PTS)

- To create a delay using the Output Compare Channel 2, we add a number of cycles (DCYCLES) to `TC2` and then wait until `TCNT` is equal to `TC2`. This happens when `TLFG1(2)=1`. Assuming an E-clock of 24 MHz, complete the following table in order to generate the given delays. Maximize the pre-scale factor and minimize DYCLES (5 < DYCYCLES < 65536).

DCYCLES	Pre-scale Factor	Timer Clock Frequency	Delay
75	64	375 KHz	200 us
750	128	187.5 KHz	4 ms

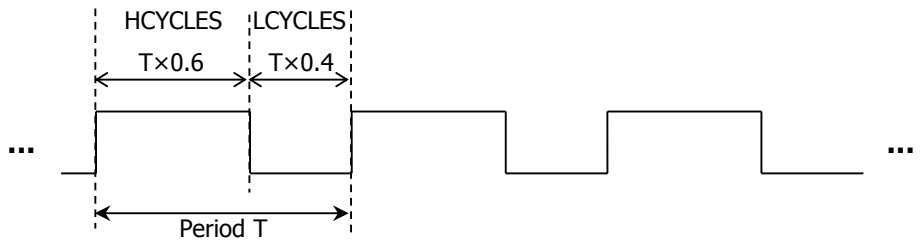
$DCYCLES \times \frac{PF}{24 \times 10^6} = Delay(sec)$

Delay = 200 us: $DCYCLES \times PF = 4800$

Delay = 4 ms: $DCYCLES \times PF = 96000$

PROBLEM 3 (30 PTS)

- Provide the pre-scale factor, HCYCLES, and LCYCLES (in number of cycles) in order to generate an active high 4-kHz digital waveform using the Output Compare function of the HCS12D Timer. Assume E-clock=24 MHz.



TCYCLES = HCYCLES + LCYCLES. $TCYCLES \times \frac{PF}{24 \times 10^6} = T(sec)$

T = 0.25 ms: $TCYCLES \times PF = 6000$

If we pick Pre-scale factor $PF = 8$, it results in $TYCLES = 750$

Finally: $HCYCLES = 750 \times 0.6 = 450,\ LCYCLES = 750 \times 0.4 = 300$