Zak Rowland
10/9/2019
CST337
Lab 1 answers

12. Yes, the second implementation is noticeably different than the first. 5 instructions are used in both methods, and the SFR is referenced twice in both methods.

13. Yes, this implementation is much more simple. There is no bitwise operation, only a simple load-store of an immediate value. 3 instructions are used and the SFR is referenced only once.

16.

- SYSCLK Cycles: 10,500,349
- PR2 Value: 41016
- Prescaler value: 7 or 1:256
- Expected PB3CLK cycles: PR2 x Prescaler = 41016 x 256 = 10,500,096
- Expected SYSCLK cycles: 10,500,096 x 4 = 42,000,384
- Actual PB3CLK division: 1

18.

- SYSCLK Cycles with keys: 10,500,349
- Nothing changed besides the PBDIV value of 3, this means the simulator cannot simulate the key lock/unlock functions.
- SYSCLK Cycles without keys: 10,500,349
- Nothing changed which would be expected because the lock remained engaged, however PBDIV still gets the value of 3 which means the simulator doesn't simulate the lock.

23. I swapped the order of the keys and the LED blinks must faster, this means PB3DIV value isn't being changed on the hardware.

24.

- SYSCLK cycles: 8,446,973
- Time between toggles: 8,446,973/84,000,000 = 0.1 seconds
- No, expecting half a second not 0.1 seconds.
- (2^24)/84MHz = 0.1997 seconds per rollover, must rollover twice and about halfway to another rollover.
    - ((2^24)*2) + 8,446,973 = 42,001,405 total cycles. 42,001,405/84MHz = 0.5 seconds
- This doesn't make the stopwatch unusable or inaccurate, it just requires some math to work out the actual values.

25. Pass count will skip a breakpoint a set number of times before it pauses again.

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26. Works fine for global variables and SFRs, local variables work too as long as the address is entered only.

27.

- Program (hardware) breakpoints: 8
- Data breakpoints: 4
- Data Capture breakpoints: 3
- Software breakpoints are unlimited if supported.
- Hardware breakpoints are written to internal debug registers while software breakpoints are written to flash program memory.
- Hardware breakpoints are applied to program memory or data memory, and software breakpoints are applied to program memory only.
    - Flash memory degrades over time which is why software breakpoints affect device endurance.

28.

- SA: Source data address
- SD: Source data value
- S2A: Address of second source (used in compares)
- S2D: Data of second source (used for immediates)
- DA: Destination data address
- DD: Destination data value

29. a. A value written to the LATxSET SFRs by first reading the LATx register, sets any specified bits as one, and writes back to the LATx register. Writing a 0 will do nothing so there's no need to target certain bits that way.

29. b. The operation of LATxSET is already essentially an OR operation. LATxSET is looking for bits to set, so if the bit is a 0 it sets a 1, if the bit is 1 it stays a 1.