CPE 301 - EMBEDDED SYSTEMS DESIGN
Spring 2017

HOMEWORK No. 5

DUE (beginning of class) March 6

NOTE: All programs must be handed in as printouts of Arduino Sketch files plus a screen shot showing they have compiled without errors.

All Homework must be submitted as print outs from a text or WORD file. Complex equations and diagrams can be submitted as hand drawn figures (or scanned images) inserted in spaces in the print out. Please be sure to keep a copy of anything you submit for homework or Lab.

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1. Modify the Blink program you did from Chapter 3 (Arduino UNO version on page 85 of the textbook) so that the function MyDelay(mSecondsApx) uses the Arduino ATmega2560 timer1 in Normal mode to generate a delay of (mSecondsApx * one millisecond) before returning.

2. The international tuning standard for musical instruments is “A” above middle C” at a frequency of 440Hz. Write an Arduino Mega C language program to generate this tuning frequency and sound a 440 Hz tone on a loudspeaker connected to PortB.6 using Timer 1.

3. Write an Arduino Mega C language program using the Arduino ATmega2560 timer1 in Normal mode to generate a 12 kHz square wave on PortB.6 using Timer 1.

4. Write an Arduino Mega C language program to generate a 500Hz signal on PortB.6 using Timer 1 in Normal mode. The wave should have a 30% duty cycle (duty cycle = high time / period).

Extra Credit question (optional) - Total points possible for this HW = 150

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5. Write an Arduino Mega C language function using Timer 1 in Normal mode to open and close a digital camera shutter. Assume when the shutter release is pressed, the shutter speed is passed to your function and that PortB.7 controls the camera shutter. When PortB.7 is 0 the shutter is closed and when PortB.7 is 1 the shutter is open. Assume an initialization program has initialized and cleared PortB.7.

Typical shutter speeds are expressed in fractions of a second. Create a table for your function to use to create shutter speeds of: 1, 1/2, 1/4, 1/8, 1/15. 1/30, 1/60, 1/125, 1/250, 1/500, 1/1000. The values passed corresponding to these shutter speeds are 0 through 10. That is, if a 0 is passed the shutter speed is to be 1 second and if a 1 is passed the shutter speed is to be one half second, etc.