

HOMEWORK No. 5

DUE before 11:59 PM, October 16

Description of Purpose

The purpose of this assignment is to help us learn how to program the Arduino board. In addition, we will be focusing on how to use timers as well as familiarizing ourselves with the different ports and function of the Arduino. Overall, this assignment is an extension about Arduino in which we are having hands-on learning.

Resources on WebCampus for learning to use the Arduino Timer:

ATmega328PTimersMod.pdf

ATmega2560TimerCalculations.pdf

Timer summary1.pdf

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).
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.