**CG1112 EPP 2**

**Week 6 – Tutorial 3 – Part 1**

Objectives:

* Explore the PWM block in the Atmel microcontroller.

**Q1.**

We saw that the AT328p has 3 Timers capable of generating 6 individual PWM signals. Consider the following scenarios and describe how you will be able to resolve the challenges.

1. Describe a SW approach to generate a PWM signal that is not dependent on the HW PWM peripheral block within the microcontroller. What is the drawback of generating the PWM using this approach?
2. The microcontroller that you have to use for a particular project (not the AT328p) doesn’t have any PWM module. How can you still generate a PWM signal WITHOUT relying on the software-based approach that you did in Part A?

(Recall HW-based solutions from EPP1)

1. You feel that the approach in the earlier part is going to add additional cost to your project and you decide that stick with the AT328P. You require a very low-frequency PWM signal and even with the largest pre-scaler setting, the period is still too high. How will you be able to generate a PWM signal with the required period?

Propose at least **THREE** different approaches that can involve both HW and SW.

**Q2.**

In the studio, you were driving a single motor. If we were to drive both Motors concurrently, one possibility is to use both Timer 0 and 2. Assume that both Timer blocks are configured to use Interrupts and that the microcontroller was executing code in your loop() routine prior to the interrupts.

1. If both these interrupts were to be triggered at the same time, what would be the sequence of execution?
2. If Timer 0 triggered the interrupt just before Timer 2, what would be the sequence of execution?