Embedded Real-Time Systems (AME 3623)
Homework 6

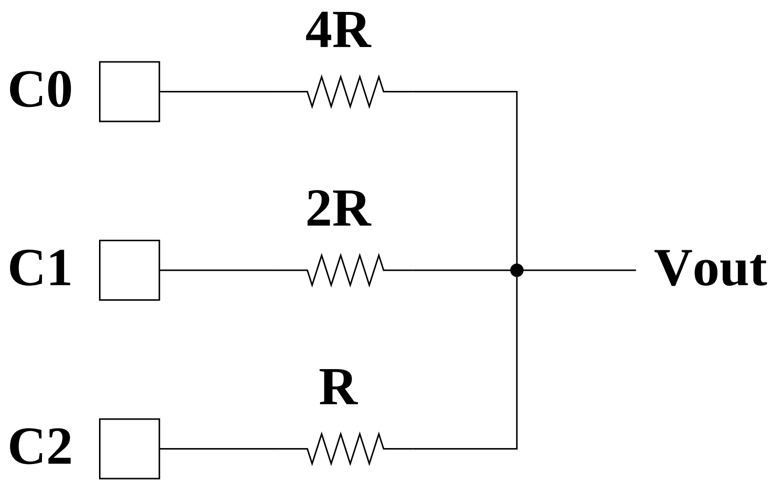
April 25, 2006

This homework assignment is due on Tuesday, May 2nd at 5:00pm. Your work may be handed in electronically (use the **Homework 6** digital dropbox on D2L) or in hardcopy form (in person or to my office).

This assignment must be done individually: do not share/discuss your answers with others or look at the answers of others.

Question 1

Consider the following circuit in which three digital outputs ($C0$, $C1$, $C2$) drive an analog circuit. For bit values 0 and 1, each pin will be driven at $0V$ and $+5V$, respectively.



(20pts) Starting from Kirkoff's law, derive an equation for $Vout$ in terms of the three digital signals.

(10pts) For each possible combination of boolean values for the Ci's, give the actual value of $Vout$.

Question 2

(10pts) Give two disadvantages for performing I/O through polling.

(10pts) Explain (in brief) how the use of *interrupts* solves these two problems.

(10pts) List two necessary conditions for there to be a shared data problem.

(15pts) Suppose we want a small segment of code – called $donow()$ – to be executed precisely once every $5.12ms$. What is the timer0 prescalar configuration and the (psuedo)code for the interrupt routine?

Question 3

Consider a hybrid priority and round-robin scheduler that is **non-preemptive**. Consider also three regularly-scheduled processes:

Task 1 executes at $2Hz$/priority 2 and requires $50ms$ of processing time (it moves from the *waiting* to the *ready* state at $t = 0, .5s, 1s, 1.5s$, etc.).

Task 2 executes at $4Hz$/priority 2 and requires $100ms$ of processing time (and moves from waiting to ready at $t = 0.01, .251s, .501s, .751s, 1.01s$, etc.).

Task 3 executes at $1Hz$/priority 1 and requires $300ms$ of processing (and moves from waiting to ready at $t = 0, 1s, 2s$, etc.).

Assume that priority 2 is the highest priority (this is not the case for all OS's).

(20pts) At $50ms$ intervals, show which process is occupying the processor at any given time for the interval $t = [0s, 1.5s]$.

Question 4

How much time did you spend on this assignment?