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# **Homework 3 – Interrupts**

**Due Date: Friday, October 19, 2012**

**Weight: 30 pts**

**Problem 1 (10 points total)**

**In your own words, what is an interrupt? What is the interrupt vector table?**

Interrupts are signals that stop processes or timers due to a higher priority event. Hardware and software interrupts are used in applications that require “hard” timing. Software interrupts are dependent on certain conditions is met in your code. Hardware interrupts are typically user or sensor inputs such as switches and buttons. When there are multiple interrupts the order they are processed in depend on when they arrived and their set priority.

The interrupt vector table information of the control registers for interrupts. It lists the bits used in the various registers used to control enables, flags, and interrupt priority. One more thing it does is implicitly show the natural priority of interrupts; the order of interrupts in the table.

**Problem 2 (5 points total)**

**Describe the purpose/function of an interrupt service procedure (ISP) or interrupt handler.**

The ISP acts with regard to interrupt time and priority. For different interrupts there are different sequences of actions that must be taken depending on the interrupt type. ISP are simply the procedures that correlate to the type of interrupt that occurred.

**Problem 3 (5 points total)**

**If two different interrupts are “triggered” at the same time, describe how the CPU knows which one to handle first.**

Interrupts are prioritized from 1 to 7, where 7 is the highest, in which will be done first. There are three bits in the IPCX register that determines this prioritization. The next determinant (if two interrupts had the same priority) would be natural priority which means that things are executed in descending order on the table. So the closer your interrupt is to the top the higher natural priority.

**Problem 4 (10 points total)**

**Provide an example of a real-world problem or application that uses interrupts. Describe the kinds of interrupts needed for the problem or application. I recommend that you research a problem that you are interested in studying, for your example.**

Generator governance systems must use interrupts in typical control functions. A 505H digital governor uses interrupts in conjunction with a settable deadband to determine when to actuate the system input gate. You would need interrupts when a frequency fluctuation is outside your settable deadband so that the system reacted smoothly to system speed variations especially in a larger scheme where many generators are tied together across the grid. Others possible used would be for the software dynamically controlling the input since it operates as a closed loop and is constantly getting feedback it needs to be hard-timed and input reactive. It would also need interrupts for user inputs like emergency shutdown.