CPE355 - Real time embedded kernels - Spring'11
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Homework Assignment #4
Due date: 11am, Thursday, February 2nd 2012

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Homework turned in after the deadline, will not be graded.

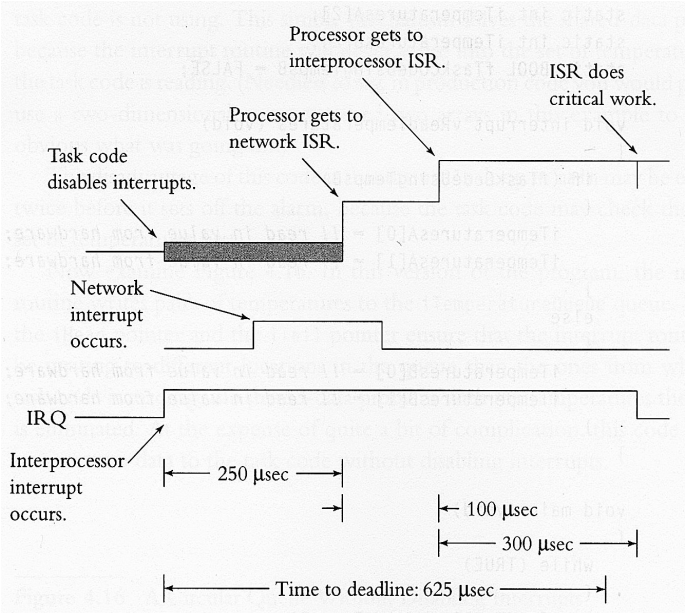
1) (20pts) Look at the following code, which is very similar to what we discussed in class.

```
static int iSeconds, iMinutes, iHours;
void interrupt vUpdateTime (void)
{
   ++iSeconds;
   if (iSeconds >= 60)
   {
      iSeconds = 0;
      ++iMinutes;
      if (iMinutes >= 60)
      {
         iMinutes = 0;
         ++iHours;
         if (iHours >= 24)
            iHours = 0;
      }
   }
   !! Deal with the hardware
}
```

```
void vSetTimeZone (int iZoneOld, int iZoneNew)
{
   int iHoursTemp;

   /* Get the current 'hours' of the time */
   disable ();
   iHoursTemp = iHours;
   enable ();

   /* Adjust for the new time zone. */
   iHoursTemp = iHoursTemp + iZoneNew---iZoneOld;

   /* Adjust for daylight savings time, since not all places in
      the world go to daylight savings time at the same time. */
   if (fIsDaylightSavings (iZoneOld))
      ++iHoursTemp;
   if (fIsDaylightSavings (iZoneNew))
      --iHoursTemp;

   /* Save the new 'hours' of the time */
   disable ();
   iHours = iHoursTemp;
   enable ();
}
```

Now someone has written a subroutine to change the time zone by changing the **iHours** variable. The subroutine takes into account the difference in the two time zones and then makes adjustments to deal with the fact that one or both of the time zone may currently be observing daylight savings time. To reduce the period during which this subroutine must disable interrupts, the subroutine copies the **iHours** variable into the local, non-shared **iHoursTemp** variable, does the calculation, and copies the final result back at the end. Does this work?

2) (20pts) In class we discussed worst case scenarios and the importance of interrupt priorities. In that topic we discussed the following diagram.



If you assign the network interrupt as a lower and if we assume that the interprocessor interrupt takes 350µsec, then what is the worst-case interrupt latency for the networking interrupt?

3) (20pts) In computer architectures, briefly explain the need for a memory buffer in I/O devices.

4) (10pts) Define the "shared data problem".

5) (10pts) What is one disadvantage of polling.

6) (20pts) Briefly explain why it is a problem to wait inside of an ISR for a digital I/O pin to change state.