ECE/CS 5780/6780: Embedded System Design

Scott R. Little

Midterm 2 Solution
Exam grades will be final on 04/16/2008.
Please discuss any questions about the grading of a question with the person who graded that question.

Question 1: Scott
Question 2: Scott
Question 3: Steve
Question 4: Anthony
Class average is 64.
This will give you an idea of how you scored although 5780 and 6780 are graded on different curves.

74-80  A
69-73  A-
64-68  B+
59-63  B
54-58  B-
49-53  C+
44-48  C
43-0   C-
Question 1a - 1st Option

- 4 points.
  - Read input capture time.
  - Setup for the next capture.
  - Clear the flag register.
4 points.

- Set TIOS for input capture.
- Set DDRT to be input for the correct bits.
- Set TCTL3/4 to setup the edge triggering.
- Set TIE for interrupts if desired.
- Set TSCR1/2 for an appropriate TCNT period.
- Initially clear TFLG1.
Question 1b

- 6 points.
  - Finish the current instruction.
  - Push the registers \((A,B,X,Y,CC,PC,SP)\) on the stack.
  - Disable interrupts.
  - Execute the ISR.
  - Pop the registers from the stack.
  - Begin executing the user code again.
Question 2a

- 10 points.
- Non-blocking scheduler.
- Key: - normal code, * semaphore code, @ waiting for the semaphore

<table>
<thead>
<tr>
<th>Thread</th>
<th>T1-</th>
<th>T2-</th>
<th>T3-</th>
<th>T1-</th>
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<th>T3-</th>
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<tbody>
<tr>
<td>Clock time</td>
<td>20ms</td>
<td>40ms</td>
<td>60ms</td>
<td>80ms</td>
<td>100ms</td>
<td>120ms</td>
<td>140ms</td>
<td>160ms</td>
<td>180ms</td>
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<tr>
<td>T1-</td>
<td>T1*</td>
<td>T2-</td>
<td>T2@</td>
<td>T3-</td>
<td>T3@</td>
<td>T1*</td>
<td>T2*</td>
<td>T3@</td>
<td>T2*</td>
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<tr>
<td>190ms</td>
<td>200ms</td>
<td>210ms</td>
<td>220ms</td>
<td>230ms</td>
<td>240ms</td>
<td>260ms</td>
<td>280ms</td>
<td>300ms</td>
<td>310ms</td>
</tr>
</tbody>
</table>
10 points.

Blocking scheduler.

Key: - normal code, * semaphore code, # put onto blocking queue

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<tr>
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<th>T1*</th>
<th>T2-</th>
<th>T2#</th>
<th>T3-</th>
<th>T3#</th>
<th>T1*</th>
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Question 3

- 30 points.
  - Each part was worth 10 points.
  - Reasonable solutions were given full credit.
Question 4a

- 10 points.

accessMutex.wait()
    <critical section for modification>
accessMutex.signal()
10 points.

readMutex.wait()
    readers++
    if readers == 1:
        accessMutex.wait()
    readMutex.signal()
<critical section for reading>
readMutex.wait()
    readers--
    if readers == 0:
        accessMutex.signal()
readMutex.signal()