EE 308 – Homework 3
Due Feb. 7, 2005

1. Disassemble the following HC12 op codes:
   D6 22 73 20 A4 18 16 27 F9 3F
   Indicate what instructions these bytes correspond to. For each instruction indicate the addressing mode which is used.

2. Repeal Problem 1 for the following op codes:
   B7 F6 18 03 A2 17 21 5A A6 2E 04 B6 F5

3. Which of the conditional branch instructions in the following list will cause a branch to be taken if the condition code flags are: N=1, Z=0, V=0, C=1:
   (a) BCC label
   (b) BNE label
   (c) BGE label
   (d) BGT label
   (e) BHI label
   (f) BMI label
   (g) BLS label

4. Below shows a sequence of instructions to be executed by a 68HCS12. Fill in the table, showing the value in accumulator A and the state of the condition flags N, Z, V and C after each instruction. The table shows the initial value of the condition flags and A

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Accumulator A</th>
<th>N</th>
<th>Z</th>
<th>V</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSTA</td>
<td>$00</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>ADDA #$40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBA #$78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSLA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ROL A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADDA #$CF</td>
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</tr>
</tbody>
</table>

5. Consider an array of 8-bit data located in memory with a starting address of $2000 and an ending address of $201F. Write a program which will swap the first element of the array with the last element; the second element with the next-to-last element, etc.

6. Write a program to count the number of odd 16-bit numbers in a table of data. The starting address of the table is $8000, and there are $2000 numbers in the table. The numbers signed. The program should write the count into memory location $2000.

7. Write a program to compute the average on a table of N 8-bit unsigned numbers starting at address $C000 and store the result at address $2000. N is no larger than 255. (Hint: Use the ABX or ABY instruction to hold the sum, and the IDIV instruction to do the division.)