PROBLEM 4.1:
(14 points) Perform Part B “TMS320C5510 Assembly Tutorial” of TI Lab 1 and submit your answers to the questions in Part B on sheets stapled together and separate from the remaining problems of the homework. Do not include work for other homework problems on these sheets.

PROBLEM 4.2:
(10 points) Consider a TMS320C5510 with hexadecimal data values stored in accumulators AC0 and AC1, extended auxiliary registers XAR0 and XAR1, extended data-page register XDP, and locations 0200h to 0207h of the main data pages 2 and 5, as shown below. Also, let the status bit M40 be equal to 1 (accumulators treated as 40 bits), and let the status bit SXMD be equal to 1 (values are sign extended instead of being zero extended). In addition, the CPL status bit is cleared indicating that the DP direct addressing mode is selected instead of the SP direct addressing mode.

AC0: \[ \begin{array}{cccccccc}
F & F & F & 8 & 7 & 0 & 5 & 2 & 1 & B \\
\end{array} \]

AC1: \[ \begin{array}{cccc}
0 & 0 & 0 & 0 & 1 & 2 & 5 & A & 3 & 2 \\
\end{array} \]

XAR0: \[ \begin{array}{cccc}
0 & 5 & 0 & 2 & 0 & 5 \\
\end{array} \]

XAR1: \[ \begin{array}{cccc}
0 & 2 & 0 & 2 & 0 & 6 \\
\end{array} \]

XDP: \[ \begin{array}{cccc}
0 & 5 & 0 & 2 & 0 & 2 \\
\end{array} \]

Data Page 2:

\begin{array}{cccc}
0200h-2101h & F & 3 & 9 & A & 0 & 1 & C & 0 \\
0202h-0203h & 7 & 0 & 2 & 6 & 5 & 3 & 1 & 7 \\
0204h-0205h & 0 & 0 & 5 & 8 & F & 4 & 1 & 5 \\
0206h-0207h & A & 1 & 0 & 2 & 3 & 2 & 6 & 2 \\
\end{array}

Data Page 5:

\begin{array}{cccc}
0200h-0201h & 0 & 1 & 7 & D & 2 & 1 & 2 & 7 \\
0202h-0203h & 1 & 1 & 6 & 1 & 5 & 5 & 7 & 0 \\
0204h-0205h & A & B & 3 & 3 & 6 & 1 & 0 & 1 \\
0206h-0207h & 7 & E & 7 & F & F & 1 & 0 & 1 \\
\end{array}
For each of the following instructions, indicate the addressing mode used, and which address buses (BAB, CAB, DAB, EAB, or FAB) and data buses (BB, CB, DB, EB, or FB) are used, and answer the corresponding questions.  

Note: for each instruction, start with the initial values given above.

(a) (2 points) MOV *AR1+, AC0  
- Addressing Mode (Circle One):  
  Immediate k16 absolute k23 absolute DP direct Register bit-direct  
  AR indirect Dual AR indirect CDP indirect Coefficient indirect  
- Address Busses used (Circle All that Apply):  
  BAB  CAB  DAB  EAB  FAB  None  
- Data Busses used (Circle All that Apply):  
  BB  CB  DB  EB  FB  None  
- Determine the values stored in AR1 and AC0 and, if applicable, in any modified data memory locations (address and stored values) after this instruction is executed.

(b) (2 points) MOV #-7 << #16, AC0  
- Addressing Mode (Circle One):  
  Immediate k16 absolute k23 absolute DP direct Register bit-direct  
  AR indirect Dual AR indirect CDP indirect Coefficient indirect  
- Address Busses used (Circle All that Apply):  
  BAB  CAB  DAB  EAB  FAB  None  
- Data Busses used (Circle All that Apply):  
  BB  CB  DB  EB  FB  None  
- Determine the value stored in AC0 and, if applicable, in any modified data memory locations (address and stored values) after this instruction is executed.

(c) (2 points) MOV mmap(@AR0), AC1  
- Addressing Mode (Circle One):  
  Immediate k16 absolute k23 absolute DP direct Register bit-direct  
  AR indirect Dual AR indirect CDP indirect Coefficient indirect  
- Address Busses used (Circle All that Apply):  
  BAB  CAB  DAB  EAB  FAB  None  
- Data Busses used (Circle All that Apply):  
  BB  CB  DB  EB  FB  None  
- Determine the values stored in AR0 and AC1 and, if applicable, in any modified data memory locations (address and stored values) after this instruction is executed.
(d) (2 points) MOV AC0, dbl(*AR0+)

- Addressing Mode (Circle One):
  Immediate  k16 absolute  k23 absolute  DP direct  Register bit-direct
  AR indirect  Dual AR indirect  CDP indirect  Coefficient indirect

- Address Busses used (Circle One):
  BAB  CAB  DAB  EAB  FAB  None

- Data Busses used (Circle One):
  BB  CB  DB  EB  FB  None

- Determine the values stored in AR1, AC1 and, if applicable, in any modified memory locations (address and stored values) after this instruction is executed.

(e) (2 points) BCLR @4, AC1

- Addressing Mode (Circle One):
  Immediate  k16 absolute  k23 absolute  DP direct  Register bit-direct
  AR indirect  Dual AR indirect  CDP indirect  Coefficient indirect

- Address Busses used (Circle One):
  BAB  CAB  DAB  EAB  FAB  None

- Data Busses used (Circle One):
  BB  CB  DB  EB  FB  None

- Determine the value stored in AC0 and, if applicable, in any modified memory locations (address and stored values) after this instruction is executed.

PROBLEM 4.3:

(5 points)

(a) (3 points) Provide a memory-map table showing how the following data values are stored in the TMS320C5510 32-bit wide data/program memory:

<table>
<thead>
<tr>
<th>Data Value</th>
<th>Data Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF0011EFh</td>
<td>050103h</td>
</tr>
<tr>
<td>hi_byte(0003h)</td>
<td>hi_byte(050101h)</td>
</tr>
<tr>
<td>17F8h</td>
<td>050100h</td>
</tr>
<tr>
<td>3344311Eh</td>
<td>050106h</td>
</tr>
</tbody>
</table>

(b) (2 points) Consider the following instruction:

 MOV dbl(*(#050107h)), AC0

- Indicate the data bus address generated for this instruction.

- Considering the data values stored in memory as in (a), indicate the value of AC0 after this instruction is executed.