EE 352 Homework 0
Redekopp

Name: ___________________________________________ Score: ________
Due: See Blackboard

Use this HW as a review and assessment or your knowledge of binary representation systems and computer arithmetic.

1.) **Architecture Overview:** Study the lecture slides posted on Blackboard and answer the following questions. (5 pts. each)

   a. **True / False:** To overcome the memory wall problem, most architectural improvements focus on reducing memory latency because it is easier to improve than bandwidth.

   b. **True / False:** A primary reason for the movement toward processors with multiple, simple cores is the effect of power consumption on high frequency, complex cores.

2.) Perform the following number system conversions. Note: It may be easier to convert them to the desired base in a different order than shown here. (2 pts. per conversion)

   a. 1100101.1011\(_2\) = ?\(_8\) = ?\(_{16}\) = ?\(_{10}\)

   b. 1A9.D\(_{16}\) = ?\(_8\) = ?\(_2\) = ?\(_{10}\)

   c. 617\(_8\) = ?\(_{16}\) = ?\(_2\) = ?\(_{10}\)

3.) What are the corresponding decimal representations for the following binary strings? (2 pts. each)

<table>
<thead>
<tr>
<th>Binary String</th>
<th>8-bit unsigned format</th>
<th>8-bit 2’s complement format</th>
</tr>
</thead>
<tbody>
<tr>
<td>10110110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11011011</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.) For each of the following decimal numbers find the corresponding 8-bit representation using the indicated systems. Note: Some numbers may NOT be representable w/ 8-bits. If this is the case, put **NA** for the answer. Also find the minimum bits needed to represent the number in the 2’s complement system. (2 pts. ea.)

<table>
<thead>
<tr>
<th>Signed Mag.</th>
<th>2’s Complement</th>
<th>Minimum bits needed using 2’s complement</th>
</tr>
</thead>
<tbody>
<tr>
<td>-128</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.) Each C declaration of the variable \( x \) is initialized to a value in decimal. Show that value represented in hex using the appropriate size indicated by the variable type (e.g. char = 1-byte = 2 hex digits). Do not use a calculator. (2 pts. each)

a. short int \( x = 13; \)
b. short int \( x = -32,767; \)
c. unsigned char \( x = 246; \)
d. int \( x = -4096; \)
e. unsigned char \( x = 193; \)
f. int \( x = -1; \)
g. unsigned char \( x = \text{‘a’}; \)
h. short int \( x = 40; \)
i. unsigned char \( x = 97; \)
j. char \( x = -79; \)

6.) Convert the powers of 2 shown below to its approximate decimal value using K to represent \( 10^3 \), M for \( 10^6 \), G for \( 10^9 \), and T for \( 10^{12} \). (e.g. \( 2^{12} \approx 4K \)) [2 pts. each]

a. \( 2^{19} = ? \)
   i. \( 9K \)
   ii. \( 512K \)
   iii. \( 512M \)
   iv. \( 256K \)
   v. \( 256M \)
   c. \( 2^{43} = ? \)
   i. \( 8G \)
   ii. \( 8T \)
   iii. \( 16M \)
   iv. \( 16G \)
   v. \( 16T \)

b. \( 2^{36} = ? \)
   i. \( 64M \)
   ii. \( 64G \)
   iii. \( 8M \)
   iv. \( 8G \)
   v. \( 8T \)
   d. \( 2^{24} = ? \)
   i. \( 4K \)
   ii. \( 4M \)
   iii. \( 8M \)
   iv. \( 16M \)
   v. \( 16G \)