EE 109 Homework 2

Name: _________________________________________  Score: ________
Due: See class website

Enter your answers on Blackboard..Assignments..HW..Homework 2

**Data Representation**

1.) 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. $1A9_{16} = ?_8 = ?_2 = ?_{10}$
   c. $617_8 = ?_{16} = ?_2 = ?_{10}$

2.) 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>

3.) 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. (4 pts. ea.)

<table>
<thead>
<tr>
<th>2’s Complement</th>
<th>Minimum bits needed using 2’s complement</th>
</tr>
</thead>
<tbody>
<tr>
<td>-128</td>
<td></td>
</tr>
<tr>
<td>+31</td>
<td></td>
</tr>
<tr>
<td>+59</td>
<td></td>
</tr>
<tr>
<td>-16</td>
<td></td>
</tr>
</tbody>
</table>

4.) 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). Assume a 32-bit computer system where 'int' = 4-bytes. Use a calculator only if you have to. (3 pts. each)

   a. short int x = 13;
   b. short int x = -32,767;
   c. unsigned char = 246;
   d. int x = -4096;
   e. unsigned char x = 193;
   f. int x = -1;
   g. unsigned char x = ‘a’;
   h. short int x = 40;
   i. unsigned char x = 97;
   j. char x = -79;
5.) 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. $256M$

b. $2^{36} = ?$
   
   i. $64M$
   ii. $64G$
   iii. $8M$
   iv. $8G$
   v. $8T$

c. $2^{43} = ?$
   
   i. $8G$
   ii. $8T$
   iii. $16M$
   iv. $16G$
   v. $16T$

d. $2^{24} = ?$
   
   i. $4K$
   ii. $4M$
   iii. $8M$
   iv. $16M$
   v. $16G$