3/19/12 - Please turn in your check-ins.
Reminder: Check-off Lab 6 by Wed, Homework #7 due Wed, Start on your Final Projects NOW!

WARM UP - Design a circuit to decode the "thermometer code" shown below, and design the circuitry necessary to implement it to allow shift operations in a logarithmic barrel shifter.

For an 8-bit input with control $k_2 k_1 k_0$:
Thermometer code for mask:

<table>
<thead>
<tr>
<th>$k_2 k_1 k_0$</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 0</td>
<td>000000000</td>
</tr>
<tr>
<td>0 0 1</td>
<td>100000000</td>
</tr>
<tr>
<td>0 1 0</td>
<td>110000000</td>
</tr>
<tr>
<td>0 1 1</td>
<td>111000000</td>
</tr>
<tr>
<td>1 0 0</td>
<td>111100000</td>
</tr>
<tr>
<td>1 0 1</td>
<td>111110000</td>
</tr>
<tr>
<td>1 1 0</td>
<td>111111000</td>
</tr>
<tr>
<td>1 1 1</td>
<td>111111100</td>
</tr>
</tbody>
</table>

$= y_7 y_6 y_5 y_4 y_3 y_2 y_1 y_0$
"Mask" for right shifts:

Shift Right 2: \( \text{LSR} \ 2 \):

\[
0 \ 0 \ a_7 \ a_6 \ a_5 \ a_4 \ a_3 \ a_2
\]

Mask: \( \text{1 1 0 0 0 0 0 0 0} \)

For left shifts: \( \text{LSL} \ 2 \):

\[
a_5 \ a_4 \ a_3 \ a_2 \ a_1 \ a_0 \ 0 0
\]

Mask: \( \text{0 0 0 0 0 0 0 1} \)

\( \text{Reverse of right mask} \)

\[
\begin{align*}
Y_7 & \\
Y_6 & \\
Y_5 & \\
Y_4 & \\
Y_3 & \\
Y_2 & \\
Y_1 & \\
Y_0 & \\
\end{align*}
\]

\[
\begin{align*}
Y_7 \ Y_0 & \\
\text{RL} & \leftarrow \text{Masks}
\end{align*}
\]
Now we have R?L masks, how to apply to shifter output?

is this a shift?

= 1 if right shift

right mask R (i.e. Y0 for bit 0)

= 0 if kill right

rotation result

0 if

= 0 if

rot. result

= 0 or

if this bit is masked

NOR

00 1 1 1

01 1

10

11 0

only 1 if

a. it is not killed

b. AND rot. result = 1 to begin

is this bit masked?

left mask L (i.e. Y7 for bit 0)
Op codes needed:

Shift
left
$k_2$
$k_1$
$k_0$

$= 32 \text{ op.}$

$f(7:0)$ takes up lots of op codes

RSO ← Pass A
Reading Assignment: Begin Ch 12.

Check-In: "Describe the inputs and outputs of a Full Adder."