Exam 3 Review

COMP370
Introduction to Computer Architecture

Topics
• Finite State Automata
• Flip-Flops
• Sequential Logic Circuit Design
• Assembler Programming
• Machine Language

Topics not covered in class will not be on the exam.

Textbook Coverage
• Read Chapter 4

A word from our lawyer:
• The exam may contain questions from any of the material covered in class since the beginning of the class.
One Page of Notes

• You are allowed one and only one 8½ by 11 inch page of notes during this exam.
• You are not allowed to use more than 187 square inches of paper surface
• You will do better if you make your own page of notes and not copy your friend’s notes.

Layers

• Applications
• Middleware – other CS classes
• High level languages
• Machine Language – COMP375
• Microcode
• Logic circuits – COMP370
• Gates
• Transistors
• Silicon structures

Overview of Flip-Flop Design Process

1. Specifications start with a word description
2. Create a Finite State Automata to model the system
3. Create a state table to indicate next states
4. Convert next states and outputs to output and flip flop input equations
5. Simplify logic expressions
6. Draw resulting circuits

Example Flip-Flop Design

• The output will be true if two or more 1’s are received in a row. Once true, the output should be true forever.
Create the Truth Table

<table>
<thead>
<tr>
<th>Qa</th>
<th>Qb</th>
<th>in</th>
<th>Da</th>
<th>Db</th>
<th>out</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td>d</td>
<td>d</td>
</tr>
</tbody>
</table>

Create Equation for Da

<table>
<thead>
<tr>
<th>Qb'n</th>
<th>Qb'n</th>
<th>Qb'n'</th>
<th>Qb'n'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qa</td>
<td>Qa</td>
<td>d</td>
<td>d</td>
</tr>
</tbody>
</table>

\[ Da = Qa + Qb \times \text{In} \]

Create Equation for Db

<table>
<thead>
<tr>
<th>Qb'n</th>
<th>Qb'n</th>
<th>Qb'n'</th>
<th>Qb'n'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qa</td>
<td>Qa</td>
<td>d</td>
<td>d</td>
</tr>
</tbody>
</table>

\[ Db = Qa \times Qb' \times \text{In} \]

Create Equation for Output

<table>
<thead>
<tr>
<th>Qb'n</th>
<th>Qb'n</th>
<th>Qb'n'</th>
<th>Qb'n'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qa</td>
<td>Qa</td>
<td>d</td>
<td>d</td>
</tr>
</tbody>
</table>

\[ \text{Output} = Qa \]
Jumping Around

• What does this do if the compare is true?
• What does this do if the compare is false?

cmp eax, dragon
je princess
princess: sub eax, knight

Duplicate Names

• Remember that the AL register and the EAX register share 8 bits in the CPU.
  mov al, eightones
  mov eax, 0
  mov eax, allones
  mov al, 0

Likely Test Questions

• Design a sequential circuit using Flip-Flops
• Write a simple assembler program
• Explain what an assembler program does
• Convert machine language to assembler

Final Exam

The final exam is on Wednesday, May 6, from 10:30am to 12:30pm.

The syllabus has an incorrect date and time