ATTENDANCE:
Saturday: Seriani, Richard, Bledsoe, John, Bingham, Deborah

Homework questions and comments:
<Seriani, Richard> In the homework, the author wants us to give all possible POS or SOP expressions for the function for some. Do I need to give several functions in the answer?

<Jones, Richard> First, remember when I introduced algebra and later K-maps, I indicated that there were sometimes more than one minimal solution for a problem. I said that if there was two or more, you needed to give me two of them. We have had several examples in class where I showed how to do that.

<Jones, Richard> Second, if the problem says "Give all possible SOP solutions", you are to group the 1's "and don't cares if present", and give the minimal SOP expression(s). If it says "Give all possible POS solutions", you are to group the 0's "and don't cares if present".

<Seriani, Richard> Ok, I see it I guess. I see an example in my notes without don't cares

<Jones, Richard> Remember that you have to group ALL available 1's (or 0's), but you only have to group don't cares which make the solution simpler. You can leave unneeded don't cares ungrouped.

<Seriani, Richard> I have 1 more Question about homework. You did say it is ok to use MultiSim to check Boolean homework before we turn it in?

<Jones, Richard> Absolutely. Just show all work.

<Seriani, Richard> Thanks. It’s good at catching stupid mistakes.

<Jones, Richard> The papers I'm grading now have a lot of people doing K-maps up to a point and then finishing the simplification by algebra. This is a NO! NO! You must do it all with the k-maps.

<Bledsoe, John> Found some mistakes and typos in the Overview state machine tutorials. Do you want list?

<Jones, Richard> Please email me alist.

LAB 6 formal report question:
<Jones, Richard> The question was “since lab 6 formal counts double, are the requirements the same?”

<Jones, Richard> Lab 6 counts double because of the design work you have to perform and document as well as the fact that I require all tables to be made and filled out in a word processor as mentioned last week. The only things by hand are your schematics. Your report design portion, should look a lot like the tutorial. I.e., a lot of work. If you want to add a week of time to the due date for the lab, feel free. I'm behind enough as it is.
NO Lab 7 FORMAL REPORT NOTICE!

LAB 7, MOD counter definition:

If you understand what a mod count means, hands
A mod counter is nothing more then a name for a device which counts a certain number of states. Anyone want to compare this type of counter to a STATE MACHINE?

It has to be in numerical order.

In a mod counter, we are more interested in the number of states, vice the states themselves. And yes, a mod counter usually, but not necessarily, is in numerical order. For example, a BCD counter is a mod 10 counter. It counts from 0 to 9 which is 10 states. A binary counter is a mod 16 counter. It counts from 0 to 15. A counter which counts from 0 to 7 is a mod 8 counter and so on and so on.

The 1st part of the lab has you designing a mod 7 or a "divide by 7" counter. We have to use flip flops with it and it most likely should be an asynchronous counter, i.e., the Q from the previous stage clocks the next stage and so on. **If your clear inputs are active low inputs, the output of the final gate in your decoding circuitry had better be active low.**

You could, if you wanted to, design this like a state machine but that is overkill. All you need to do is figure out the logic for a reset gate which when it senses a particular count, it resets all the clr inputs. Therefore naturally, all the clears must be tied to the output of this gate string. What kind of gates and how many is up to your design process, however, **RULE ONE for this lab, “All gates must have no more than 2 inputs.”** and whatever gate sequence you choose, it must be the simplest sequence!

Therefore, you might need a k-map to simplify the expression.

Is "divide by" just a high pulse on one line for every so many clock pulses?

Good question, and yes. For instance, a single flipflop is a divide by two. It takes the freq of the input clock and divides it by two. (or the period and...
multiplies it by two.) It doesn't need that high pulse after a certain number of pulses to be a divide by ?? But that is a common way to do it and it will be what you do with your project mod x counter.

THE 4516 CHIP

<Jones, Richard> The second circuit uses a 4516 counter chip. Remember that the 4516 has several bugs in the MULTI-SIM model, but they are all when the chip is counting down. The chip should only count up the way I have this circuit set up, so no problem.

<Satterfield, Rickey> Can we use the 4516 chip in our project? ANSWER: Yes, but there are better chips to use. I have yet to see anyone use the 4516.

The 7474 CHIP:

<Jones, Richard> The last version of the 7474 chip (D flip-flop) had a bug in it that was about the clock in the model. The actual 7474 has a leading edge clock, while the model had a trailing edge. This circuit requires a d-ff with a leading edge clock. If the bug is still there (and I haven't checked yet) just include an inverter in front of the d ff clock input. (Actually, I have now checked it and the bug has been fixed!) If you should decide to use a JK set up as a D ff in place of the 7474, you must include an inverter in front of the 7476's trailing edge clock to turn it into a leading edge clock.

Page 2 questions:

<Jones, Richard> Note the two questions in the top part of page 2 that have to be answered. Don't lose 10 points by ignoring them please.......  

MOD-11 counter:

<Jones, Richard> You are going to design a mod-11 counter, ie, 0 to 10. This lab is very important to your project. The projects mod counter tends to be reported to be the hardest part of the project. The encoder will output a certain number of pulses per rotation. You will calculate how many pulses per inch. You will design the mod X couner to count these pulses and output a pulse for every inch traveled. The counter must be able to count up and down. These pulses will be counted by another counter.

<Satterfield, Rickey> When I designed the mod counter for project, I came up with an uneven number. Do we round up? ANSWER: The wheel diameter is set up so the number will come up pretty close to being a whole number.

<Jones, Richard> Hook the circuit up as shown. The box that says "logic gates" in the figure is a "black box". You have to fill it with logic gates which will decode the
output and give a pulse when needed to make the circuit reset at the correct number of states to make a mod 11 counter.

<Jones, Richard> Provide the schematic, including your additional gates and a grapher output showing the sequence. Again, all gates must have no more than two inputs, and the logic structure must be the simplest. A k-map might help.

<Jones, Richard> The next page has a place for your gates for the mod counter and two more mod counters. You don't have to simulate the last two but you must design them and give their simplest logic gate structure. Attach all work for simplifying these structures.

<Jones, Richard> Again, no conclusion, no formal. No matter what the last page says.

<Seriani, Richard> Are we looking for the output at Q or D?

<Jones, Richard> Include in your logic output, the 4 q outputs, the clock, the D input and the D output.

<Seriani, Richard> In reference to spec sheet it is not on motorola.com any more.

**PROJECT:**

<Jones, Richard> The 1st email update is due by next Saturday. Get the parts ordered and start the design process. You know you need at least 3 4543's, you know you will need a 555 or 556 chip, you know you will need some kind of dff, you know you need wire wrap wire and tool, and a prototype board, etc. You can get a good order now early.

<Jones, Richard> Name your company, give yourself a position, start a journal, following the journal guidelines, use the company point of view on your e-mails. Think of it as keeping a customer updated on your progress. Of course, you wouldn't as the customer help type questions, so the analogy falls apart somewhere there. Of course, the customer could help on spec type questions and journal legal questions.

<Bingham, Deborah> If I started the Journal with the labs is it ok to include them?

<Jones, Richard> No, you will need the whole book (or two) for your project.

<Seriani, Richard> Does the Journal need to be in ink or is pencil ok?

<Jones, Richard> Pencil is fine but don't erase, line out and initial/date

<Jones, Richard> The pictorial has some pictures of the wirewrap tool and wire.

<Bingham, Deborah> Where is the pictorial?

<Jones, Richard> On the course homepage, near the bottom.

<Jones, Richard> Make sure the tool you buy is a mod tool. When you wrap a wrap, the wire needs to have 1 inch of wire stripped off of each end. When the wire is inserted into the tool, the insulation goes in up to the notch. When you place the tool over the pin to be wired, put your finger on the top and let the tool ride up lightly against your finger as you turn it. ALWAYS turn in the same direction and record your standard direction in your journal. That way, if you have to UNWRAP a wire, you know which direction to go, the opposite. Make sure that when you wire, there is alot of slack in
the wire.

<Jones, Richard> This serves two purposes.

1. shock absorption. The posts are square, not round. When you wrap the wire, the edges cut a notch in the wire at each corner. This is what allows the wrap to stay tight. But if the wire is tight, every shudder will cut the notch deeper and wire will loosen.

2. If you have to unwrap a wire, it is best to either replace the wire, or cut off the old end and strip off another inch. no slack, no room to do this.

The other end of the tool you buy is the unwrap tool. The radio shack tool has it's unwrap tool in a compartment in the end of the tool. There is a picture of a completed wrap in the pictorial. I grabbed a freshman out of the hall, gave him 5 minutes of instruction and this was his 1st wrap.

Note the insulation around the post as well as the wire. This wrap is a b+ wrap. The history behind the wrap starts with Ma Bell. They needed someway to make quick connections without solder. Unfortunately, the first wrap they used caused lots of shorts in the box, so they invented the mod tool so there wasn't a way to have a short.