(50 pts) Approx. 6 days

The second part of our unit is – without a doubt – the majority of the work. Here you'll be asked to create a circuit (described in detail below) that can display the digits of your birthday. As you do this, you'll plan out your circuit with pictures, a truth table, K-maps, and written circuit diagrams. You'll then Multisim and Breadboard your birthday circuits.

The Birthday Problem

Design a combinational logic circuit that has three inputs and seven outputs. When the inputs (X, Y, and Z) create a count from 000 to 111, the seven outputs (a through g) generate the logic required to display your date of birth on a seven-segment display. The date of birth will be displayed in the MM-DD-YY format. For example, if you were born on May 12, 2001, your design will display 05-12-01.

(more detailed description available on the Birthday Problem handout)

1. **Circuit Design Planning:** You worked through the entire Circuit Design Process in your engineering notebook. You defined the problem and drew a simple picture to illustrate the goal. Your notes continue and include:
    a. Truth tables for each of the seven segments
    b. K-Maps for each of the seven segments
    c. Simplified expressions for each of the seven segments
    d. AOI Circuits for each of the seven segments
    e. NAND/NOR circuits (as you decide) for the segments you want to use them for
2. **Multisim:** You now need to get back into Multisim and create your circuit simulation. Take your time and organize it carefully. You'll only use 3 input (SPDT) switches and you'll have a total of seven (7) outputs for the seven segments of the display. Work carefully and confirm that the circuit functions as intended before moving on!
3. **Breadboarding:** Now for the hard part: Get out your DMS Breadboard and create your complete birthday problem circuit on the breadboard. If you need more physical space to fit all your IC chips, then you can have extra breadboards attached to give you the extra room. Be careful, take your time, and keep your wires neat!

Part 1: Tasks	*20-15 points*	*14-6 points*	*5-0 points*
Written Plan for Birthday Circuit	+ You recorded your circuit design process in your engineering notebook including: + Truth Tables + K-Mapping + Simplified Expressions + AOI/NAND/NOR Circuits	- Your notes do not include all the parts of the circuit design process	- Your notes are significantly lacking - Your notes are missing completely
	15 points	*14-10 points*	*9-0 points*
Birthday Circuit Multisim	+ Your circuit is completely modeled in Multisim + Your circuit meets the circuit criteria (at least one NAND and at least one NOR) + Your circuit works properly	- Your Multisim circuit is incomplete - Your Multisim circuit does not meet all criteria	- Your Multisim circuit is significantly lacking - Your Multisim circuit is missing completely
Birthday Circuit Breadboarding	+ Your breadboarded circuit is complete + Your breadboarded circuit works as intended	- Your breadboarded circuit does not quite work right	- Your breadboarded circuit is very incomplete
Achievement: Complete your birthday problem breadboarding successfully!			