**CS375 LAB# 3**

1. Using Karnaugh maps, find optimal expressions that take a 3-bit input (x1,x2,x3) and drive each of the seven segments in a 7-segment display. The resulting circuit will display the 3-bit number on the 7-segment display. Determine sum of products (SOP) for segments 0 through 3, and product of sums (POS) for segments 4 through 6. Hand-in you Karnaugh maps, the reduced expressions, and a drawing of the completed circuit.

**Important Note: The segments of the 7-segment display are *active low*, meaning that they light when they are driven by a 0 value, and are off when they are driven by a 1 value.**



1. Using Karnaugh maps, find optimal expressions that take a 4-bit input (x1,x2,x3,x4) and drive each of the seven segments in a 7-segment display appropriately for the numbers 0 through 9. Generate SOP expressions for all segments. Enter your design using Altera’s schematic capture, so that it can be implemented on a Cyclone II EP2C20F484C7 or a Cyclone III EP3C16F484C6N. Name your input pins x1, x2, x3, and x4, and name your output segments SEG\_0, SEG\_1, SEG\_2, SEG\_3, SEG\_4, SEG\_5, SEG\_7, as corresponds to the diagram above.

**Note: Make use of *don’t care* values in your Karnaugh map to create more efficient circuits.**

1. Make your pin assignments and download your design to run on the development board. Map your input pins so that x1 is driven by board switch sw3, x2 is driven by sw2, x3 is driven by sw1, and x4 is driven by sw0. Send the output to one or more of the seven-segment displays that are available on the board. Demonstrate that your design produces the requested result for numbers 0-9.