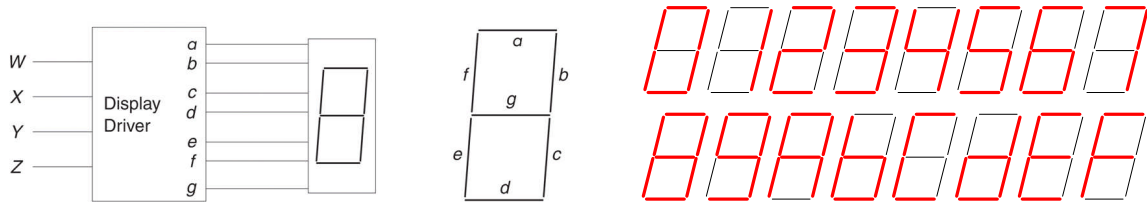


PRE-LAB

Design a display driver for a seven segment display. The input is a four-bit representation (W, X, Y, Z, with Z being the LSb) of a hexadecimal number (0 to F). The seven outputs are connected to a seven-segment display (**active low**). A sketch of the desired operation is shown below.



1. Develop a truth table for this display driver.
2. Using K-map technique, develop the minimum SOP expressions for all segments.

LAB

In this lab, you will implement the display driver on a DE2 board. To get you started, segments *a*, *b*, *c* and *d* have been implemented and three design files are available for download from the syllabus page.

- *abcd.bdf*: a schematic file to generate outputs for segments *a*, *b*, *c* and *d*. No modifications needed.
- *abcd.bsf*: a symbol file for the *abcd.bdf* schematic (used in *top.bdf*). No modifications needed.
- *top.bdf*: a top-level entity file for the design. You will need to modify this file to complete the design.

1. Create a new project for this lab. Download the provided files (*abcd.bdf*, *abcd.bsf* and *top.pdf*) and add them to your project.
2. Create a new schematic file named *efg.bdf* and implement circuits to control segments *e*, *f* and *g*. You will need to set this file (*efg.bdf*) as Top-Level Entity.
3. Compile, simulate and verify with your truth table for correct outputs.
4. Create a symbol file for *efg.bdf* file and use this symbol to complete the *top.bdf* schematic. A completed *top.pdf* schematic file would generate outputs for all seven segments. You will need to set this file (*top.bdf*) as Top Level Entity.
5. Implement and program the seven segment display driver on the Altera board.
 - a. Use *SW3*, *SW2*, *SW1*, and *SW0* for *W*, *X*, *Y*, and *Z* respectively.
 - b. Use *HEX0* as the output seven segment display.
 Note: from the DE2 supplementary notes:
 - Segment *a* is labeled as *digit 0*
 - Segment *b* is labeled as *digit 1*
 - Segment *c* is labeled as *digit 2*
 - Segment *d* is labeled as *digit 3*
 - Segment *e* is labeled as *digit 4*
 - Segment *f* is labeled as *digit 5*
 - Segment *g* is labeled as *digit 6*

Demonstrate your design to your instructor.