Lab Assignment 6

Title: Brightness control of LEDs

Learning Objective:

Learn how to control brightness of LED displays using pulse width modulation

Specification:

Design a circuit that controls brightness of LED displays based on a 4-bit input. Use pulse width modulation to control LED brightness.

Details:

Design and implement a circuit to vary brightness of 16 LEDs using PWM. Let there be 16 levels of brightness, corresponding to duty cycle varying from 0 to 15/16, in steps of 1/16. Display brightness level (numeric value) using 7-segment display.

For specification of the brightness level, define two modes – (i) switch mode and (ii) continuous mode. In "*switch mode*", 4 slide switches specify the brightness level. In "*continuous mode*", a 4-bit up/down counter specifies the brightness level. This counter repeatedly counts from 0 to 15 and then down to 0, at a rate that is perceptible to eye. Use a fifth slide switch for selecting the mode.

Express your design in VHDL, verify the logic using simulator and then synthesize and test on the FPGA board.