EE 109 - Spring 2024

Name: _____

Lab 9 - Hardware Datapath Components

Lab Section ☐ 12:30 W ☐ 2:00 W ☐ 3:30 W ☐ 11:00 F ☐ 12:30 F

TA/Instructor initials: _____

Item	Outcome	Score	Max.	
Checkpoint • Correctly generates the "DIM" signal low 1/16 of the period.	Yes/No		1	
Hardware Operation • "MID" signal is correct on scope with 5/8 duty cycle	Yes/No		2	
• UP/DOWN buttons cycle through all three intensities	Yes/No		3	
• LEFT/RIGHT buttons cycle through all three colors	Yes/No		3	
• Power and ground use short red and black wires	Yes/No		1	
• Wiring is done in a neat and orderly fashion	Yes/No		1	
Review Questions (graded after submission) • Questions below (put answers in Lab9_Answers.txt file and submit on Vocareum)			2	
Code Organization (Graded after submission) • Code is indented properly and includes comments • Program correctly initializes LCD, ADC, Ports, Timer etc. • The "`shift_load`" routine is done correctly • The "`shift1bit`" routine is done correctly	 Yes/No Yes/No Yes/No Yes/No		 1 2 3 2	
Total			21	
Open ended comments:				

Review Problems

1. (1 points) Tammy Trojan feels the gap between the MID brightness using a 37.5% PWM signal and the BRIGHT level at 100% is too much and wants to add a fourth brightness level at 75% called "LIT". In our circuit where a low signal turns the LED on, this means she needs to create a signal that is low 75% of the time, or a one 25% of the time. Assuming you had access to additional gates to add to the circuit, how could you create this signal? Write the Boolean logic express for LIT in terms of the output signals from the counter.

2. (1 point) We would like to add a feature where if the Select button is pressed on the LCD, it turns the LED off completely, and then turns it back on when Select is pressed again. Explain how this could be done without having to make any changes to the wiring of the circuit .