EE 109 - Spring 2024 Name: _____

Project - Speed Trap

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

Note: All checkoffs of the project must be done by the end of your lab session of the last week of the semester. No extensions for checkoffs will be granted past the due date for Checkpoint 3 (April 24th or 26th)

TA/Instructor initials: _____

Item	Outcome	Score	Max.	
Speed Trap Operation (15 points)				
Checkpoint 1				
• Splash screen with student's name	Yes/No		1	____
• Sensors start and stop timing, time out after 4 sec.	Yes/No		2	____
• Elapsed time and speed displayed properly	Yes/No		2	____
• Timing indicator operates properly	Yes/No		1	____
• Deduction for late check-off (-2 for checkoff during following week, no credit after that)				
Checkpoint 2				
• Rotary encoder can adjust threshold between 1 and 99 cm/sec	Yes/No		1	____
• Buzzer sounds warning if speed too high	Yes/No		1	____
• Servo motor adjusts indicator to point at correct speed	Yes/No		2	____
• Threshold stored in EEPROM and retrieved when restarted	Yes/No		1	____
• Deduction for late check-off (-2 for checkoff during following week, no credit after that)				
Checkpoint 3				
• Sends local speed to remote device	Yes/No		1	____
• Receives remote speed and displays on LCD	Yes/No		2	____
• RGB LED operates to show speed comparison	Yes/No		1	____
Code Organization (15 points)				
• Code is indented properly and includes comments	Yes/No		1	
• Program broken into separate files (≥ 4) based on function	Yes/No		1	
• Correctly initializes appropriate I/O ports	Yes/No		1	
• Speed calculation is correct (**no floating point**)	Yes/No		2	
• Buzzer uses TIMER0 for delay	Yes/No		1	
• Calculation for PWM and use of TIMER2 is correct	Yes/No		2	
• EEPROM data checked for valid value	Yes/No		1	
• Correctly initializes tri-state gate on RX line	Yes/No		1	
• USART receiver uses ISR properly	Yes/No		1	
• Review Question 1: Cost analysis provided and reasonable	Yes/No		2	
• Review Question 2: Sensible and well-thought-out response to potential reliability issues and mitigation	Yes/No		2	
Total			30	
Open ended comments:				

Review Problems

1. Cost Analysis: Assume we are building 1000 units of this system. Use the provided part numbers (see the webpage) and the digikey.com or jameco.com website to find the total cost per unit (again assume we build a quantity of 1000 units) for these speed traps. Itemize the part costs (list each part and its unit cost when bought in units of 1000) and then show the final cost per unit below. Note: You only need to price the components used in the project (not all the components in your lab kit. Also, you do not need to account for the cost of the circuit board or wires. In a real environment we would manufacture a PCB (Printed Circuit Board). As an optional task, you can search online for PCB manufacturers and what the costs and options are in creating a PCB.
2. Reliability, Health, Safety: Assume this system was to be used in a real industrial monitoring application.
    - What scenarios might you suggest testing (considering both HW and SW) before releasing the product for use?
    - How might you make your design more reliable? By reliability we don't just mean keeping it running correctly (though you should consider that), but also how you can detect that a connected component has failed to gracefully handle such situations. You can consider both HW and SW points of failure, issues related to the operational environment, etc. and how to mitigate those cases.