Lab #3 Controlling the Servomotor – a Detailed Marking Scheme

	Target Expectation **2.5 out of 3**	**Threshold Expectation** **1.5 out of 3**	
General Presentation:	The report was methodical, with clear communication of thought in a logical progression. Illustrative figures are thoughtful, and appropriately referenced.	The report was difficult to read due to poor communication of thought and/or superficial treatment of the required elements. Either too many unreferenced figures/tables, or not enough, or not appropriate for illustration of point. Poor grammar and spelling.	**Grade out of 3**
Linear Controller Design: Define your performance objectives. Show all calculations done in translating performance objectives to 2nd order DC gain, damping ratio, natural frequency, and then to constraints on Proportional/Rate Feedback controller gains. Provide the numbers selected for the proportional and derivative gains. Calculate the expected peak time, percent overshoot, and steady state step and ramp errors based on the selected values. Confirm the expected linear system response using **stepeval** and **rampeval**.	Concise mathematical development from performance objectives to 2^{nd} order pole constraints, to selection of gains that meet spec.	Selection of proportional and rate feedback gains that work, but unclear as to how they were derived, or errors made in deriving, or gains overly constraining the system response.	**Grade out of 6**
Controller Simulation: **stepeval** and **rampeval** of simulated motor response with included nonlinearities. Tabulated performance measures, and comparison between linear and nonlinear simulation. Plan for controller modification framed out.	Data clearly and concisely presented. Analysis of where performance objective(s) were not met demonstrates understanding of the theory. Plan for modifying the controller is sensible, and demonstrates insight into connection between effect of nonlinearities and linear system model.	Data obtained and tabulated, but lack of understanding of why this is done. Plan for modifying controller relies too much on 'trial and error' approach.	**Grade out of 6**

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Final Controller: Logical steps to controller redesign implemented. **stepeval** and **rampeval** of real motor demonstrate that performance objectives are achieved. Tabulated performance measures, and comparison between linear and nonlinear simulation and real motor. Analysis of the differences in behaviour provided.	Plan for modifying the controller is implemented, with any deviation in plan documented. Successful in achieving performance measures for the real motor. Logical reasoning as to whether the nonlinear model is useful in for controller design in this application.	Lack of understanding as to why the controller initially implemented on the real motor may have failed. Although controller adjusted so that real motor meets performance specifications, little explanation given as to why. Little understanding of difference between linear model, nonlinear model, and real system.	**Grade out of 6**
Robustness: The motor response under conditions outside of the normal operating range is properly tabulated and analyzed.	Clear explanation of the tests performed, and quantitative analysis of the differences. Insight into why the observed differences make sense.	Differences are tabulated, but little analysis is provided.	**Grade out of 4**
		Total Grade out of 25	