

Last Name (Print): _____

First Name (Print): _____

ID number (Last 4 digits): _____

Section: _____

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

Problem	Weight	Score
1	25	
2	25	
3	25	
4	25	
Total	100	

INSTRUCTIONS

1. You have 2 hours to complete this exam.
2. This is a closed book exam. You may use three 8.5" \times 11" note sheets.
3. Calculators are allowed.
4. Solve each part of the problem in the space following the question. If you need more space, continue your solution on the reverse side labeling the page with the question number; for example, **Problem 1.2 Continued**. **NO** credit will be given to solutions that do not meet this requirement.
5. **DO NOT REMOVE ANY PAGES FROM THIS EXAM.** Loose papers will not be accepted and a grade of **ZERO** will be assigned.
6. The quality of your analysis and evaluation is as important as your answers. Your reasoning must be precise and clear; your complete English sentences should convey what you are doing. **To receive credit, you must show your work.**

Problem 1: (25 Points)

Figure 1 shows a closed-loop system where the plant transfer function is

$$G_p(s) = \frac{1}{s^2}$$

The desired pole locations of the closed-loop transfer function are $-3 \pm j4$.

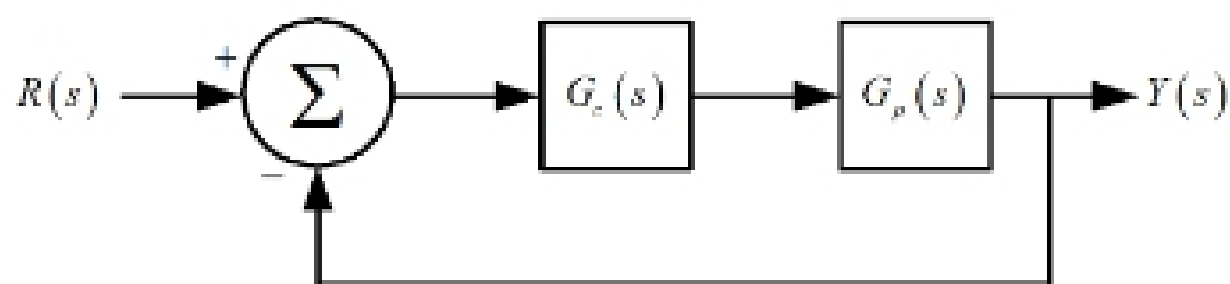


Figure 1: Feedback control system.

1. (5 points) Can the desired performance specifications be met using either a proportional or phase-lag compensator $G_c(s)$? Justify your answer.

2. (5 points) Estimate the rise-time, time to peak, percent overshoot and settling time of the closed-loop unit-step response.