ELEC 341 – Graded Assignments

Assignment A6
Proportional Control

10 Marks

Learning Objectives

Proportional (P) Control
Root Locus
Steady-State Error
Overshoot
Goal Overshoot

Matlab
- pzmap()
- rla()

In Fig 1, a Proportional Controller K controls a system Gs using a sensor Hs.
Gs and Hs have the Open-Loop characteristics specified in Fig 2.

Q1 2 mark(s) Open-Loop TF

Compute the open-loop transfer function **GH**.
Design the feedback gain **Kh**.
Find the ultimate gain **Ku**.

GH	Input = Des Pos (m)	Output = Measured Pos (m)
• Q1.GH	(pure)	LTI
• Q1.Kh	(m/V)	Scalar
• Q1.Ku	(V/m)	Scalar

Q2 3 mark(s) Closed-Loop TF

Compute the closed-loop transfer function **Gcl** with **K = Ku/2**.
Calculate the settle time **Ts** and steady-state error **Ess**.
Calculate the overshoot **OS**, and goal overshoot **GOS**.

Gcl	Input = Des Pos (m)	Output = Actual Pos (m)
• Q2.Gcl	(pure)	LTI
• Q2.Ts	(s)	Scalar
• Q2.Ess	(%)	Scalar
• Q2.OS	(%)	Scalar
• Q2.GOS	(%)	Scalar

Figure 1

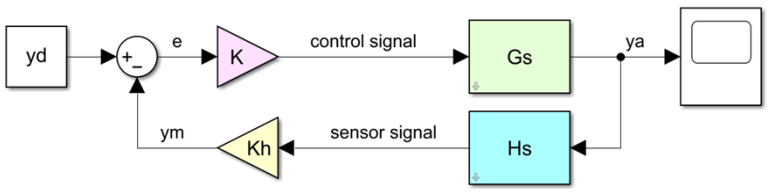
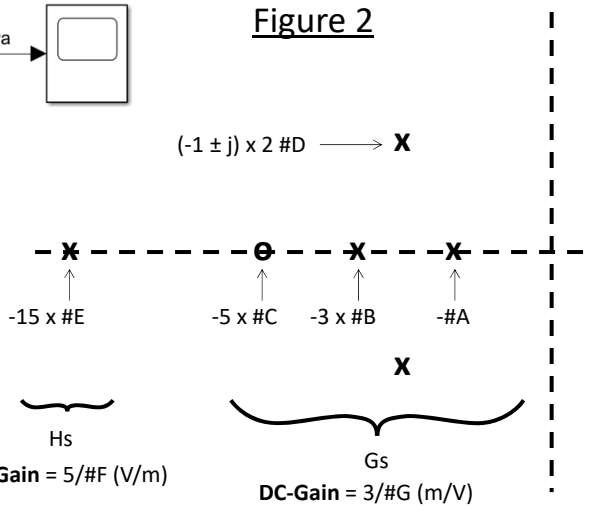


Figure 2



COW:
*Use **pzmap()** to check your OLTF.*
Are the poles & zeros correct ???

*Tune the gain **K** to meet the following RCGs for a **Unit Step** input.*

REQUIREMENTS:

***GOS** = 20%*

Q3 2 mark(s) Tuned Gain

Specify your tuned gain **K**.

Calculate the resulting settle time **Ts** and steady-state error **Ess**.

- Q3.K (V/m) Scalar
- Q3.Ts (s) Scalar
- Q3.Ess (%) Scalar

Q4 3 mark(s) Min Error

Specify the gain **K** that achieves the minimum possible steady-state error **Ess**.

Calculate the resulting overshoot **OS**, and goal overshoot **GOS**.

- Q4.K (V/m) Scalar
- Q4.Ess (%) Scalar
- Q4.OS (%) Scalar
- Q4.GOS (%) Scalar

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