**Open Ended Lab**

**LAB # 13**



**Fall 2024**

**CSE-310L Control Systems Lab**

Submitted by: **Ali Asghar**

Registration No.: **21PWCSE2059**

Class Section: **C**

“On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work.”

Submitted to:

**Dr. Muniba Ashfaq**

Date:

**12th January 2025**

**Department of Computer Systems Engineering**

**University of Engineering and Technology, Peshawar**

**Task:**

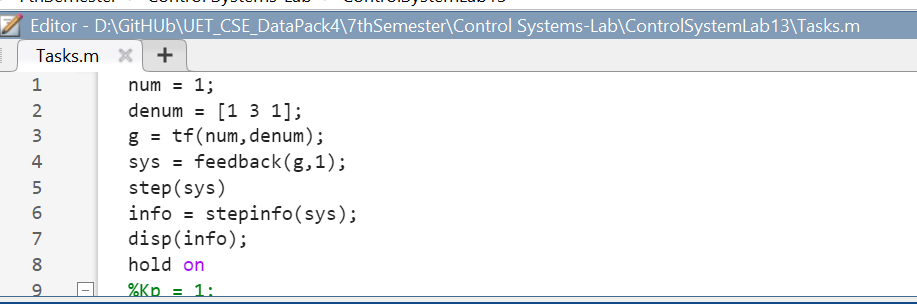
Design negative feedback system both in MATLAB & Simulink and control the step response of given system. Performance requirement of the closed loop system is that the steady state error is zero and overshoot less than 30%.

Given System is:

**Solution:**

**Make a negative feedback system, find its step response and record all characteristic values**

**Code:**

****

**Output:**

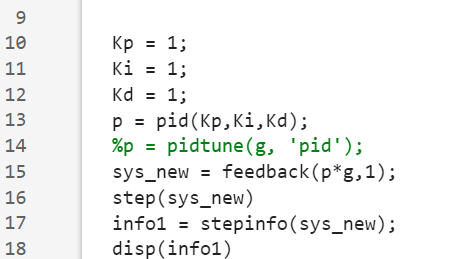
**A screenshot of a computer program

Description automatically generated**A graph with a curved line

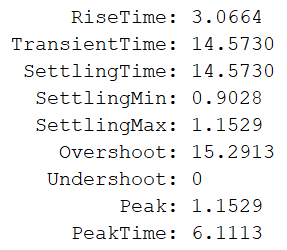
Description automatically generated

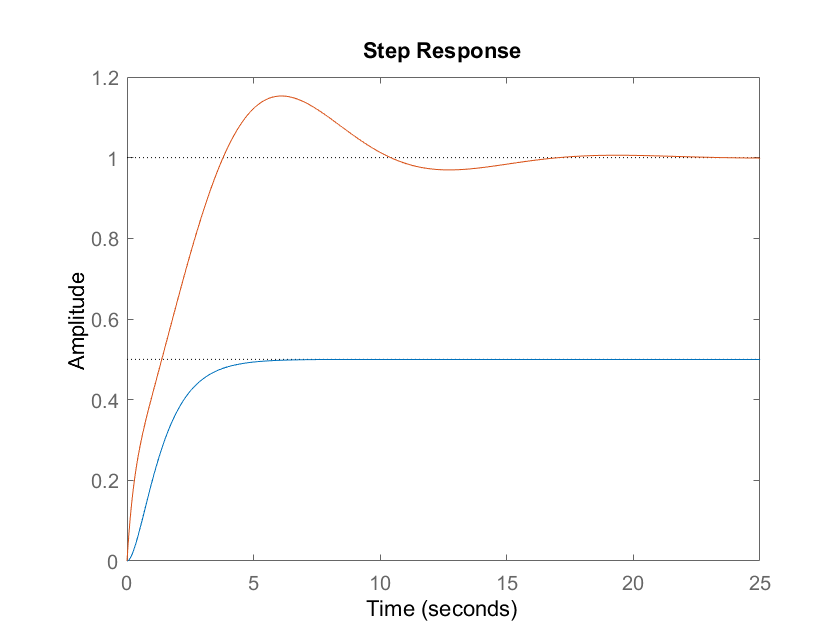
**Make a PID Controller and connect it in series with the given system.**

**Code:**

****

**Output:**

**A screenshot of a computer program

Description automatically generated**

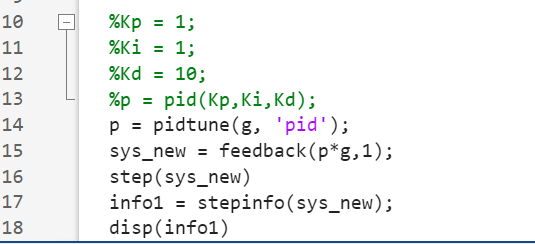
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Kp | Ki | Kd | Rise time | Overshoot | Settling time |
| 1 | 1 | 1 | 3.0664 | 15.2913 | 14.5730 |
| 2 | 1 | 1 | 2.6355 | 4.5423 | 8.6536 |
| 3 | 1 | 1 | 2.1970 | 0 | 3.9121 |
| 4 | 1 | 1 | 1.7348 | 0 | 6.6004 |
| 5 | 1 | 1 | 1.3212 | 0 | 8.5893 |
| 6 | 1 | 1 | 1.0402 | 0 | 9.9991 |
| 7 | 1 | 1 | 0.8623 | 0 | 11.1156 |
| 8 | 1 | 1 | 0.7435 | 0 | 12.0324 |
| 9 | 1 | 1 | 0.6588 | 1.1576 | 12.7951 |
| 10 | 1 | 1 | 0.5949 | 3.1044 | 13.4306 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Kp | Ki | Kd | Rise time | Overshoot | Settling time |
| 1 | 2 | 1 | 2.0151 | 30.8734 | 17.9779 |
| 1 | 3 | 1 | 1.6116 | 41.5970 | 21.8559 |
| 1 | 4 | 1 | 1.3847 | 49.9383 | 28.1483 |
| 1 | 5 | 1 | 1.2347 | 56.8391 | 39.0038 |
| 1 | 6 | 1 | 1.1264 | 62.7645 | 61.0010 |
| 1 | 7 | 1 | 1.0433 | 67.9772 | 125.2505 |

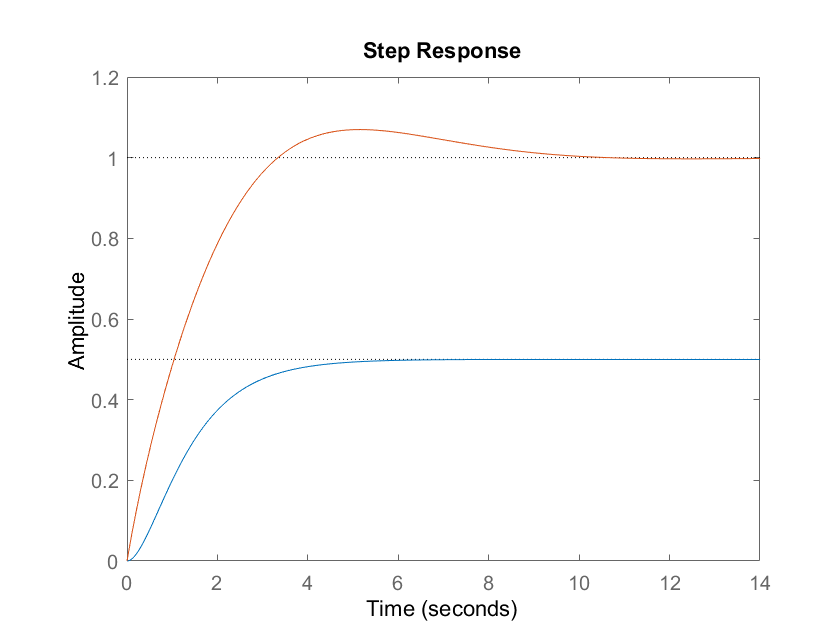
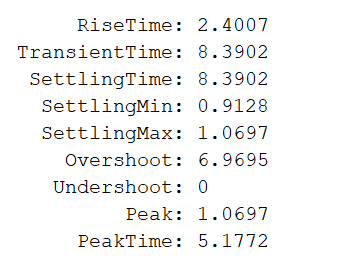
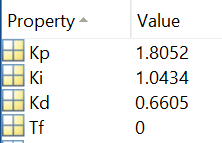
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Kp | Ki | Kd | Rise time | Overshoot | Settling time |
| 1 | 1 | 2 | 3.6468 | 13.6957 | 16.8929 |
| 1 | 1 | 3 | 4.1326 | 12.8097 | 18.9431 |
| 1 | 1 | 4 | 4.5664 | 12.2312 | 20.7995 |
| 1 | 1 | 5 | 4.9623 | 11.8131 | 22.5090 |
| 1 | 1 | 6 | 5.3282 | 11.4893 | 24.1024 |
| 1 | 1 | 7 | 5.6692 | 11.2257 | 25.6008 |
| 1 | 1 | 8 | 5.9890 | 11.0032 | 27.0199 |
| 1 | 1 | 9 | 6.2903 | 10.8102 | 28.3712 |
| 1 | 1 | 10 | 6.5753 | 10.6391 | 29.6636 |

**Using pidtune for Tuning the values for PID Controller**

**Code:**

****

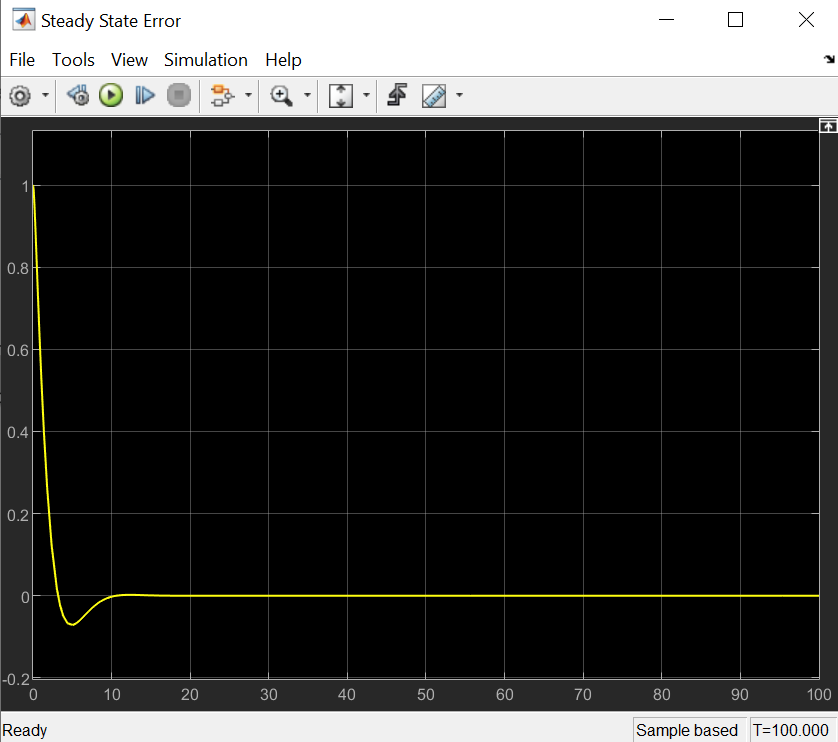
**Output:**

****

**Simulink:**

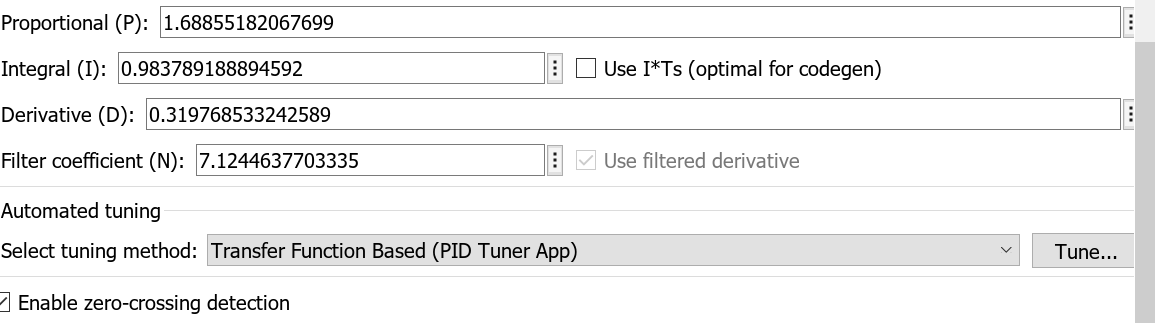
**A diagram of a computer

Description automatically generated with medium confidence**

****

**A screen shot of a graph

Description automatically generated**

****

**Conclusion:**

A PID Controller was designed successfully for reducing the steady state error of the given system.