

AERO 422 Homework #3

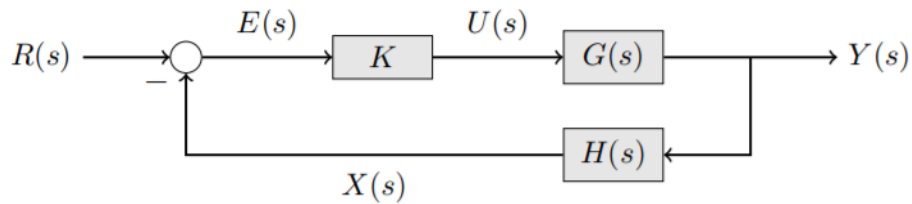
Instructor: Vedang Deshpande

Due: October 05, 2021 at 12:00a.m.

Fall 2021

(28 Points)

1. A block diagram for a spacecraft docking control problem is given by



where K represents the controller. It is important to keep in mind that this is a docking problem, so overshooting (going past) the reference input is not desired.

- (a) (1 point) Evaluate the transfer function from $U(s)$ to $Y(s)$ if the input/output relationship satisfies

$$m\ddot{y}(t) + c\dot{y}(t) = u(t)$$

[Solution in other document.](#)

- (b) (1 point) Evaluate the transfer function from $Y(s)$ to $X(s)$ if

$$\dot{x}(t) + \tau x(t) = \tau y(t)$$

[Solution in other document.](#)

- (c) (2 points) Consider the closed loop transfer function $T(s)$, such that $Y(s) = T(s) \cdot R(s)$. $T(s)$ has the form,

$$T(s) = \frac{a_1 s + 60}{b_3 s^3 + b_2 s^2 + b_1 s + 60}$$

Determine the values of a_1 , b_3 , b_2 , b_1 in the text boxes below when $K = 5$, $m = 2$, $c = 7$, and $\tau = 12$.

[Solution in other document.](#)