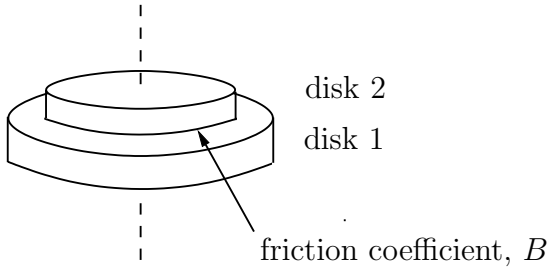
EE 231 first semester AY2021-2022 : Homework 02

1. Given the coupled disks system



where J_1 and J_2 are the moments of inertia of disk 1 and disk 2, respectively, and B is the coefficient of friction between the bottom surface of disk 2 and the top surface of disk 1. Let $\dot{\theta}_1$ and $\dot{\theta}_2$, be the angular velocities of disk 1 and disk 2, respectively, about the vertical axis.

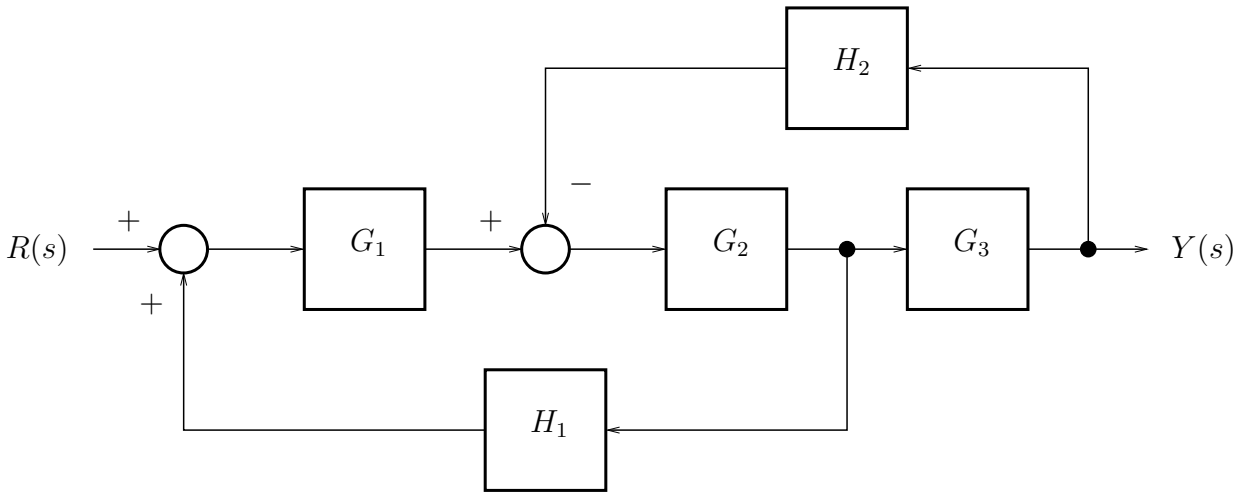
Assume that the differential equation model for the coupled disk system is

$$\begin{aligned} J_1\ddot{\theta}_1 &= -B(\dot{\theta}_1 - \dot{\theta}_2) \\ J_2\ddot{\theta}_2 &= B(\dot{\theta}_1 - \dot{\theta}_2) \end{aligned}$$

Assuming initial conditions are $\dot{\theta}_1(0) \neq 0$ and $\dot{\theta}_2(0) = 0$), solve for $\dot{\theta}_1(t)$ using classical approach (not Laplace transform).

2. Assuming the same initial conditions in (1), solve for $\dot{\theta}_1(t)$ Laplace transforms.

3. Given the following block diagram.



Determine $Y(s)/R(s)$.