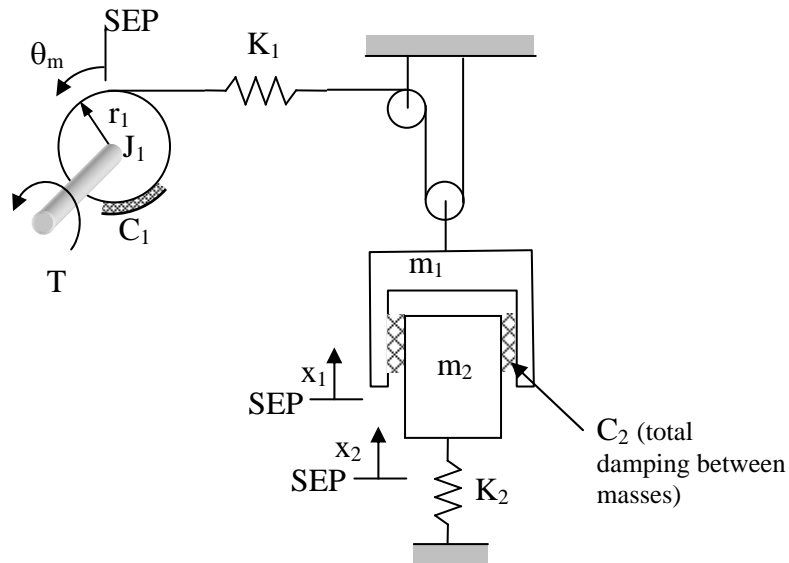


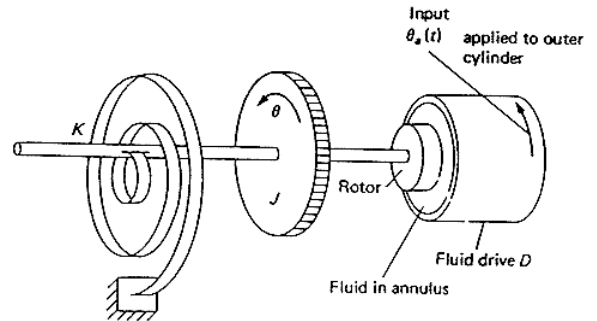
ES205
Homework Lecture 5

Problem 5.1 For the system shown below the input torque is T and the output variables are θ_m , x_1 and x_2 . Write the equations for the disk, mass 1 and mass 2 in state-space form.

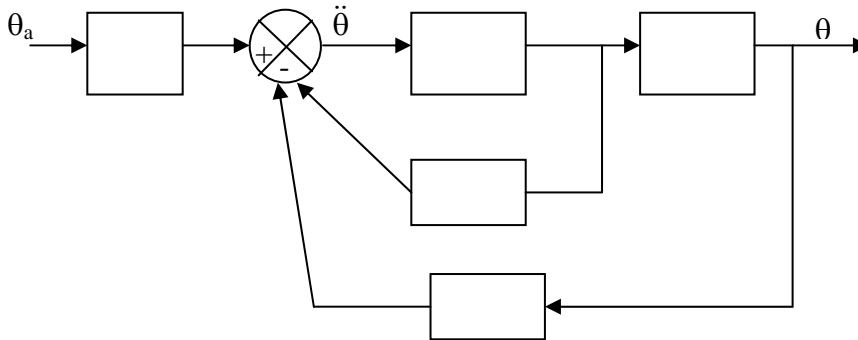


Problem 5.2 The differential equation for the fluid transmission system shown is:

$$J\ddot{\theta} + D\dot{\theta} + K\theta = D\dot{\theta}_a$$



- a) Complete the block diagram representation below for this system with θ_a as the input and θ as the output.



- b) For numerical reasons, we should not implement a simulation that has a differentiation block as in the example above. For the same system, develop a new simulation diagram that does not contain a differentiation block (do not simply obtain a single transfer function between the output and the input!). Hint: Rather than solving the equation for the highest derivative, solve the equation so that the output of your summing junction is as shown to the right.

