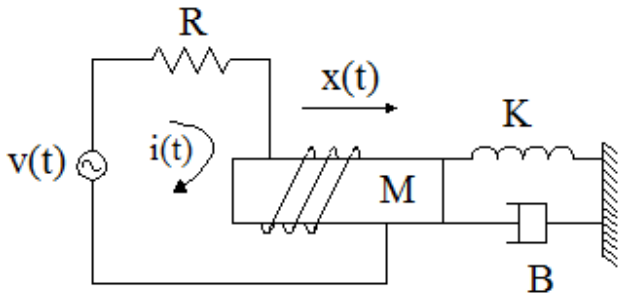
Kafrelsheikh University
Faculty of Engineering
Department of Mechanical Engineering
Year: 4 Subject: Automatic Control In Mechanical Systems
Name:

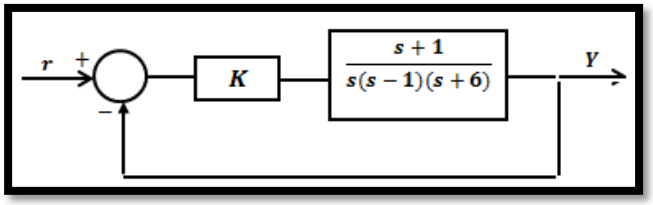
Date: 17 Jan 2011
Time allowed: 3 Hours
Full Mark: 70
Final Exam: 1 page
Academic Number:

Prob. 1 [20]

A. Find the transfer function $\frac{X(s)}{V(s)}$ for the system shown below

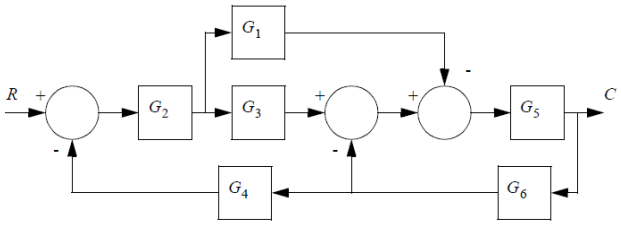


B. Consider the system shown in fig. below, Determine the range of K over which the system is stable



Prob. 2 [20]

A. Reduce the block diagram shown below to find the transfer function $C(s)/R(s)$



B. Check the stability of the system that have the characteristic equation

$$s^6 + 4s^5 + 3s^4 + 2s^3 + s^2 + 4s + 4$$

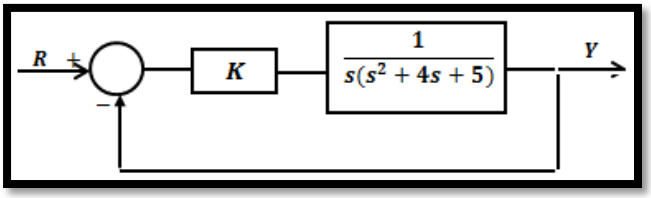
C. Use **MATLAB** to find the exact roots.

Prob. 3 [10]

A. Use **MATLAB** to find the response of the velocity of the car for the case in which the input jumps from being $u = 0$ at time $t = 0$ to a constant $u = 500\ N$ thereafter. Assume that the car mass is $100\ kg$ and viscous drag coefficient $b = 50\ N.sec/m$.

Prob. 4 [20]

A. For the system shown below,



i. Construct the **Root locus**, then determine
ii. Coordinate of **centroid,** Slopes of **asymptotes**
iii. **Imaginary** axis crossing
iv. The value of K for a pole location $S = (-10, 0)$

B. Write down the **MATLAB** commands to sketch the **Root Locus** for the system shown above

Best Wishes
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