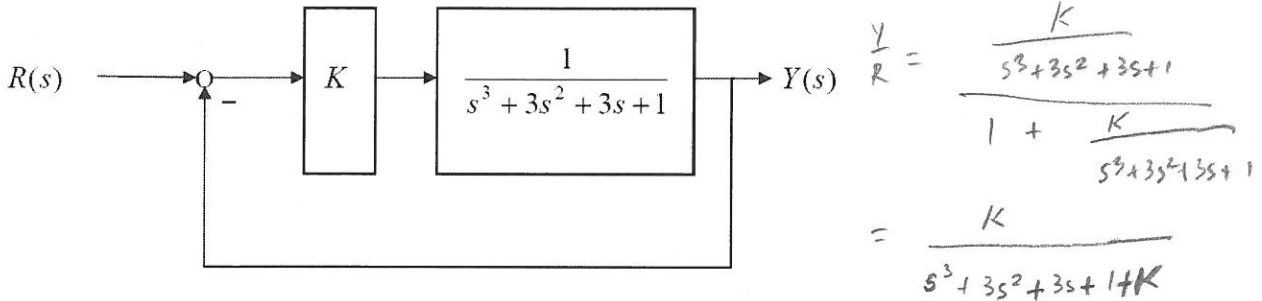


SOLUTIONS

ECE311 Quiz 3

Prob. 1. For the system below, determine the range of K for stability.

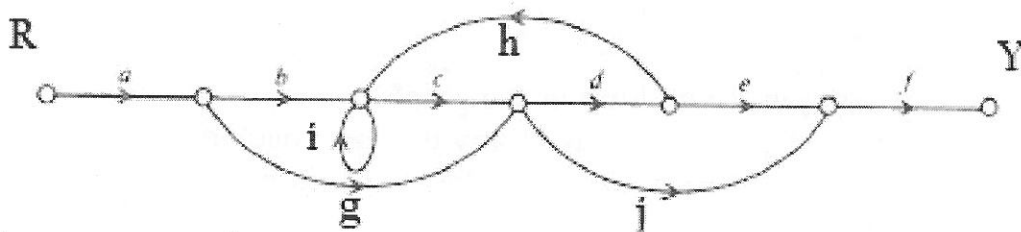


s^3	1	3		3	=	$\frac{1+K-9}{-3}$	=	$\frac{9-(1+K)}{3}$
s^2	3	1+K		3		-3		
s^1	$\frac{9-(1+K)}{3}$							
s^0	1+K							

$\Rightarrow \frac{9-(1+K)}{3} > 0 \Rightarrow 9 > 1+K \Rightarrow 8 > K$
 $\Rightarrow 1+K > 0 \Rightarrow K > -1$

$\Rightarrow \underline{-1 < K < 8}$

Prob. 2. Use Mason's Rule to determine the transfer function Y/R .



PATH GAINS:

$$P_1 = abcdef$$

$$P_2 = egdef$$

$$P_3 = agjif$$

$$P_4 = abcjf$$

LOOPS:

$$L_1 = i$$

$$L_2 = cdh$$

L_1 and L_2 touch

$$\Rightarrow \Delta = 1 - (i + cdh)$$

determinant

COFACTORS:

$$\Delta_1 = 1$$

$$\Delta_2 = 1 - i$$

$$\Delta_3 = 1 - i$$

$$\Delta_4 = 1$$

$$\Rightarrow \frac{Y}{R} = \frac{\sum_{i=1}^4 P_i \Delta_i}{\Delta} = \frac{abcdef + agdef(1-i) + agjif(1-i) + abcjf}{1 - (i + cdh)}$$