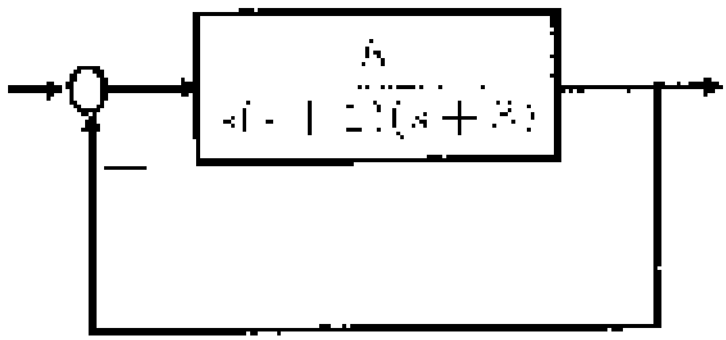
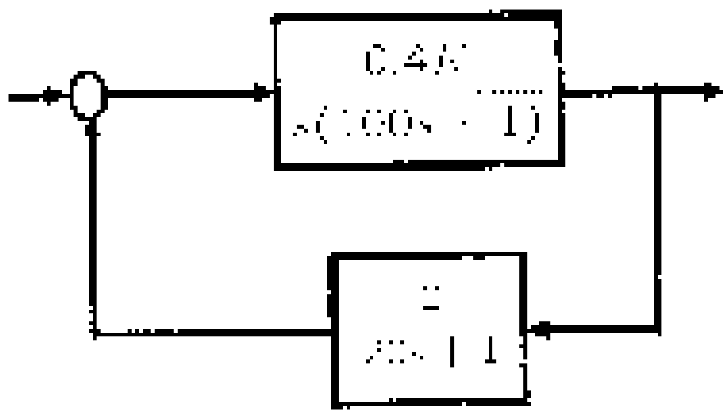
Mech-465 Automatic Control
Lecture 4 Assignment

1. Consider the feedback system below. For what range of K is the system stable?



2. Consider the feedback system below. For what value of K is the system marginally stable? For that value of K, what is the frequency of the oscillation?



3. For the unity feedback system with

$$G(s) = \frac{500}{(s+20)(s^2+4s+10)}$$

Find the steady-state error if the input is $40u(t)$ and $70tu(t)$

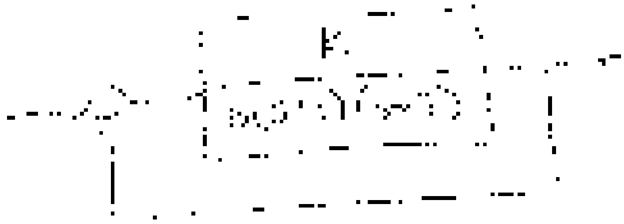
4. For the feedback system below:

(a) Find K_p, K_v and K_a.

(b) Find the steady state error for an input of $50u(t)$ and $50t^2u(t)$

(c) State the system type

(1)



C.E. ⟹ $1 + \frac{K}{s(s+1)(s+3)} = 0$

$s(s+1)(s+3) + K = 0$

$s^3 + 4s^2 + 3s + K = 0$

Using Routh array:

s^3	1	3
s^2	4	K
s	$\frac{12-K}{4}$	
s^0	K	

For stabilizing the sys ⟸ all elements of first column must be positive.

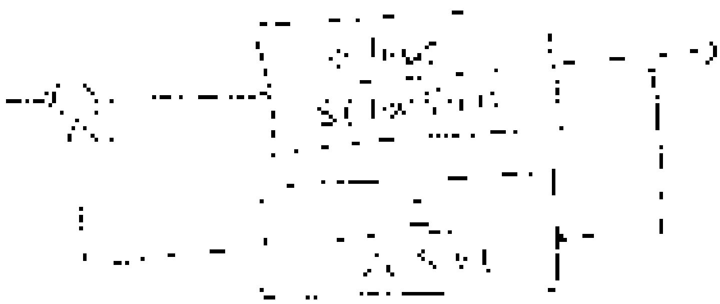
⟹ K > 0

⟹ 12 − K > 0

⟹ K < 12

$0 < K < 12$

(2)



C.E. ⟹ $1 + \frac{[illegible]}{[illegible]} = 0$

$s(1+0.5s)(1+[illegible]) + [illegible]K = 0$

[illegible] $= 0$

Using Routh array [illegible]

s^3	[illegible]		1
s^2	[illegible]		[illegible]
s^1	[illegible]		
s^0	[illegible]		

The closed loop system [illegible] is marginally stable [illegible]

[illegible]

[illegible]

Auxiliary [illegible] polynomial [illegible]

[illegible]

[illegible] frequency of oscillation [illegible]

(3) Find [illegible] the stability of [illegible] system

[illegible] $\Rightarrow$ [illegible]

Routh Array $\Rightarrow$

s^3	1	[illegible]
s^2	[illegible]	[illegible]
s^1	[illegible]	
s^0	[illegible]	

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible] integral [illegible]

[illegible]