

**Question: Determine whether the unity feedback system of Figure 1 is sta...**

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1. Determine whether the unity feedback system of Figure 1 is stable or not if

$$G(s) = \frac{240}{(s+1)(s+2)(s+3)(s+4)}$$



Figure 1.

Determine whether the unity feedback system of Figure 1 is stable or not if.

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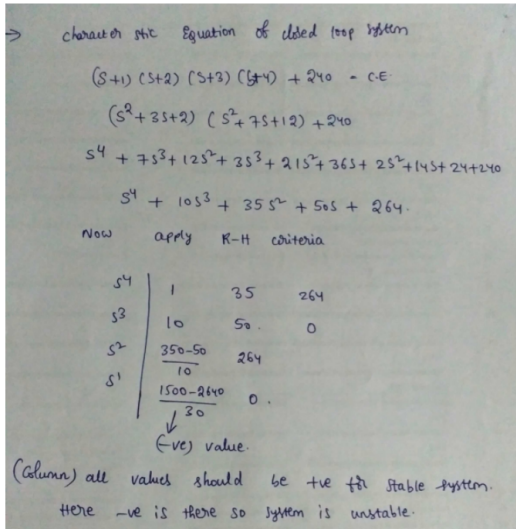
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6. Given the block diagram of a system shown in Figure P6.3, find the transfer function  $C(s)/R(s)$ . (Section: 6.2)

See answer

Given the unity feedback system of Figure P6.3 with  $G(s) = K(s+4)/s(s+1.2)(s+3)$  find the following: [Section:...]

3A. Given the unity feedback system of Figure P6.3 with

$$G(s) = \frac{K(s+4)}{s(s+1.2)(s+3)}$$

find the following: [Section: 6.4]

a. The range of  $K$  that keeps the system stable.  
b. The value of  $K$  that makes the system oscillate.

See answer

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Q: 1. For the unity feedback system:  $10.2s+2$  Transfer Fon  $1 Y(s) R(s)$  Gain Determine if this system is stable.

A: See answer 100% (3 ratings)

Q: Solve problem using Routh-Hurwitz criterion.

A: See answer 100% (8 ratings)

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**Question: A robot arm called ISAC (Intelligent Soft Arm Control) can be us...**

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3. (28 points) A robot arm called ISAC (Intelligent Soft Arm Control) can be used as part of a system to feed people with disabilities (see figure below). The control system guides the spoon to the food and then to a position near the person's mouth. The arm uses a special pneumatically controlled actuator called a rubberstator. Rubberstators consist of rubber tubes covered with fiber cord. The actuator contracts in length when pneumatic pressure is decreased. This expansion and contraction in length can drive a pulley on other device. A video camera provides the sight for the robot and the tracking loop. Assume the simplified block diagram shown below for regulating the spoon at a distance from the mouth. Find the range of K for stability.



Fig. P6.3



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**Expert Answer**

Tizian Lee answered this 1,317 answers. Was this answer helpful? 1 0

The control system is,



The general transfer function is,  
 $C(s) = \frac{G(s)}{1+G(s)H(s)}$

Here,  $R(s)$  is input of the system and  $C(s)$  is output of the system.

The gain of the controller is:  
 $G_c(s) = \frac{K}{s(s+0.01)(s+5)}$

The gain of the rubberstator and load is:  
 $G_r(s) = \frac{10}{s^2+10s+29}$

The overall gain of the system is:  
 $G(s) = G_c(s)G_r(s)$

Substitute  $G_c(s)$  and  $G_r(s)$

$$G(s) = \frac{K(s+0.01)(s+5)}{s(s+20)(s+100)} \cdot \frac{10}{s^2+10s+29}$$

$$= \frac{10Ks^2+60.1Ks+0.6K}{(s^2+120s^2+2,000s)(s^2+10s+29)}$$

$$= \frac{10Ks^2+60.1Ks+0.6K}{(s^4+130s^3+3,229s^2+23,480s^2+58,000s)}$$

For our convenience, Figure is modified and applied  $G(x)$  value it is shown below:



The transfer function of the system:

$$T(s) = \frac{G(s)}{1+G(s)H(s)}$$

Find transfer function,  $T(s)$ :

Substitute  $\frac{10Ks^2+60.1Ks+0.6K}{(s^2+130s^2+3,229s^2+23,480s^2+58,000s)}$  for  $G(s)$  and 1 for  $H(s)$ .

$$T(s) = \frac{10Ks^2+60.1Ks+0.6K}{(s^4+130s^3+3,229s^2+23,480s^2+58,000s)}$$

$$= \frac{10Ks^2+60.1Ks+0.6K}{(s^4+130s^3+3,229s^2+23,480s^2+58,000s)}$$

$$= \frac{10Ks^2+60.1Ks+0.6K}{(s^4+130s^3+3,229s^2+23,480s^2+58,000s)}$$

The characteristics equation of the system is:  
 $(s^4+130s^3+3,229s^2+23,480s^2+58,000s) = 0$

Apply the Routh-Hurwitz criterion.

$s^4$	1	3229	60.1K+58000	0
$s^3$	130	10K+3480	0.6	
$s^2$				$\frac{(-1)(10K+23480)+(130)(3229)}{130}$
$s^1$				$\frac{-10K-396290}{130}$
$s^0$				$\frac{7812.6K+7848000}{130}$
$s^2$				$\frac{-180K^2-2712488K-8324889200}{-18K+396290}$
$s^1$				$\frac{-781300K^2+2 \times 10^{10}K^2+8.5 \times 10^{13}K-6.2 \times 10^8}{-100K^2-2,712,488K-8,324,689,200}$
$s^0$				$\frac{-781,300K^2+2 \times 10^{10}K^2+8.5 \times 10^{13}K-6.2 \times 10^8}{-18K+396290}$

From Figure, for stable system,

From  $s^0$  row:  
 $0.6K > 0$   
 $K > 0$

From  $s^1$  row:  
 $-10K + 396,290 > 0$   
 Solve the above equation:  
 $K < 39,629$

From  $s^2$  row:  
 $-100K^2 + 2,712,488K - 8,324,689,200 > 0$   
 $-100K^2 + 2,712,488K + 8,324,689,200 > 0$   
 Solve the above equation:  
 $K < 2,783.4$  or  $K < 29,968.28$

From  $s^3$  row:  
 $-781,300K^2 + 2 \times 10^{10}K^2 + 8.5 \times 10^{13}K - 6.2 \times 10^8 > 0$   
 $-100K^2 + 2,712,488K - 8,324,689,200 > 0$   
 $-781,300K^2 + 2 \times 10^{10}K^2 + 8.5 \times 10^{13}K - 6.2 \times 10^8 > 0$

Solve the above equation:  
 $29,391.7 < K$ , or  $28,840 < K$ , or  $-949 < K$

Therefore, consider the  $s^1$  row to  $s^0$  row. The value of K for stable system is  $0 < K < 29908.28$

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- A: See answer
- Q: 3. (30 points) A robot arm called ISAC (Intelligent Soft Arm Control) can be used as part of a system to feed people with disabilities (see figure below). The control system guides the spoon to the food and then to a position near the person's mouth. The arm uses a special pneumatically controlled actuator called a rubberstator. Rubberstators consist of rubber tubes covered with...
- A: See answer

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See answer

Given the unity feedback system of Figure P6.3 with  $G(s) = K(s + 4)/(s(s + 1.2))(s + 3)$  find the following [Section...]

See answer

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- Q: I need answers of this matlab and simulink feedback problem 2. A robot arm called ISAC (Intelligent Soft Arm Control) can be used as part of a system to feed people with disabilities. The control system guides the spoon to the food and then to a position near the person's mouth. The arm uses a special pneumatically controlled actuator called a rubberstator. Rubberstators consist of...
- A: See answer 100% 0 rating
- Q: Please provide legible, reproducible soln so I can try solving it on my own learning from yours. Many thanks in advance.
- A: See answer 100% 0 rating

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**Question: Consider the following Routh table. How many roots are there? ...**



Consider the following Routh table. How many roots are there? Notice that the  $s^5$  row was originally all zeros. Using only the Routh table, tell how many roots of the original polynomial were in the right-half plane, in the left-half plane, and on the  $j\omega$  axis. Show all work and justify your conclusions.

$s^7$	1	2	-1	-2
$s^6$	1	2	-1	-2
$s^5$	3	4	-1	0
$s^4$	1	-1	-3	0
$s^3$	7	8	0	0
$s^2$	-15	-21	0	0
$s^1$	-9	0	0	0
$s^0$	-21	0	0	0

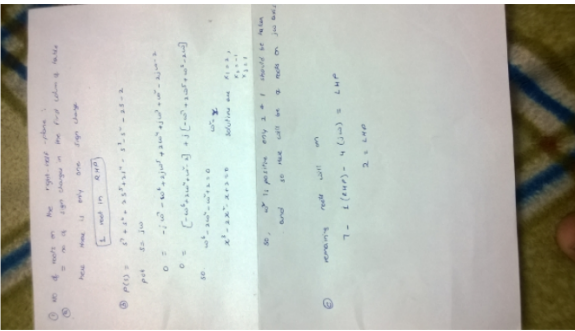
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**Expert Answer**



Amrish Reddy answered this  
47 answers

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Q: 6.17 (2/2) Consider the following Routh table. Notice that the  $s$  row was originally all zeros. Tell how many roots of the original polynomial were in the right half-plane, in the left half-plane, and on the  $j\omega$ -axis. [Section: 6.3]

A: See answer 100% (1 rating)

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Given the unity feedback system of Figure P6.3 with  $G(s) = K(s + 4)/s(s + 1.2)(s + 3)$  find the following: [Section:...] **See answer**

33. Given the unity feedback system of Figure P6.3 with  $G(s) = \frac{K(s + 4)}{s(s + 1.2)(s + 3)}$  find the following: [Section: 6.4]

- The range of  $K$  that keeps the system stable
- The value of  $K$  that makes the system oscillate

please solve as soon as possible **See answer**

6. Given the block diagram of a system shown in Figure P6.8. Find the transfer function  $G(s) = \frac{Y(s)}{U(s)}$ . [Section: 5.2]

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Q: Consider the following Routh table. Notice that the  $s^5$  row was originally all zeros. Tell how many roots of the original polynomial were in the right half-plane, in the left half-plane, and on the  $j\omega$ -axis. [Section: 6.3]

A: See answer

Q: Consider the following Routh table. Notice that the  $s^5$  row was originally all zeros. Tell how many roots of the original polynomial were in the right half-plane, in the left half-plane, and on the  $j\omega$ -axis. Notice that you should only use the properties of Routh table to solve this problem (without calculating the exact location of roots) 15 - 21 21

A: See answer 100% (1 rating)

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