Problem:
a) Solution:- Mz" = fz - gM - Czz → (5)
Mz = +z - gM - (zz - y)
$fz = Mg + Kpz (zdos - z) - Kdz(z') \rightarrow (6)$
Replace (6) with (5)
$M\ddot{z} = Mg + kpz (zdes - z) - Kdz(z') - gM - Czz'$
Mz" = (Kpz XZdes) - (Kpz XZ) - Z (Kdz + Cz)
Mz"=(Kpz * Zdes)-(Kpz * Z)-(Kdz+Cz)z'
Mz" + (Kdz + Cz)z' + (Kpz*z) = Kpz * 2des
Apply laplace transform 20=20=0 at Initial Conditions are zero
MS Z(S)+ (Kdz+Cz)SZ(S)+ KpZ*Z(S)= KbZ*Z(S)
Take common Z(S) Z(S) (MS2+(Kdz+Cz)S+Kpz)= Kpz * Zdes(S)
As we know that Z(S)= 0/P & Zdes(S)= inp
$\frac{Z(S)}{Z_{des(S)}} = \frac{K_{PZ}}{MS^2 + (K_{dZ} + C_Z)S + K_{PZ}} \rightarrow (7)$
Given Values:- M = 1 Kg
Kpz = 5 $Cz = 3.8904$ $Kdz = 15$

Put the all given values in ear(7)
Z(s) _ 5
Zdes(S) (1)52+(15+3.8904)S+5
Z(S) - 5
Zdes(S) S+ 18.89045+5
1) For Zeros
Equate the numerator = 0
Zeros = (No Zeros)
1
4 For Poles
Equate the denominator to 0
Two Poles
* S+ 18.8904 S+ 5 =0
By using Quadratic formula $-b\pm\sqrt{b^2-4ac}$ $a=1$ $b=18.8904$ $c=5$ $2a$
a=1 $b=18.8904$ $c=5$ 22
a de la servició de l
S= - 18.8904 + N(18.8904)2- 4(1)(5) = 0
$\sum_{i=1}^{n} (1)$
S=-18.8904± 18.3534
S = -18.8904 + 18.3534 $S = -18.8904 - 18.3534$
0 2000
$S_1 = -0.285$ $S_2 = -18.6219$
Dalas 0100 0 0/05 10 /010
*Poles are -0.2685, -18.6219
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b) Solution:- The Poles that we get from Part (a) Complex Plane:- (imaginary axis) The order to system (linear) to be stable, all of lits poles must have negative real parts' as shown ie they mus all lie within the left half of the s-plane. KEZ & KAZ Valves Fluctuate make four cases Let high value of both Kpz & KAZ = 100 low II II II II = 0 As use Know that In this system have no zeros & two poles. In each cases.	-1-1	
Complex Plane:- (inaginary axis) The order to system (linear) to be stable, all of (axis) The order to system (linear) to be stable, all of (axis) The best must have negative real parts' as shown in they must all lie within the left half of the s-plane. KEZ & Kdz values Fluctuate make four cases Let high value of both Kpz & Kdz = 100 low II II II II = 0 As use Know that The His system have no zeros & two poles in each cases.	b) Solution:-	
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Let high value of both type of nazzono low 11 11 11 11 11 11 11 50 As use Know that The His system have no zeros & two pokes. In each cases.	the poles must he shown i.e they mu half of the s-b	have negative real parishing shape.
In this system have no zeros, in each cases.	Let high value of low 11	of both the g naz = 100
	In this system	nave 110 zeros 1
		and the second of the second o

	7 -> Z(S) = Kpz	VI.
	Zdes(S) Ms2+(Kdz+Cz)S+KPZ	
Pul	the values	11
So	Kpz = 0	
	Z(S)O	
	Zdes(s) MS+3.8904 s +0	
	— CO D	
*	Z(S)	*
7100	Zdes(s)	1
(200	L C Li Manishan	
lhe	transfer function vanishes	
C	Complex plane is not drawn.	~7
	* * * * * * * * * * * * * * * * * * *	-4
Coso	02: (Kpz=0, Kdz=100)	
Lase	Odi- (RPZ=0), Razario del	Mica
4.51	transfer function also vanishes	
The	(because of Kpz =0)	57
	The state of the state of the state of	9.1
C200	03:- (KPZ=100, KdZ=0)	
Put.	values in eq (7)	3/
	The state of the s	171
-	(s) - 100	11
Z	les(s) = 100 les(s) = 57 3.89045 + 100	
	Zeros = (No zeros)	
50.	yamanan .	
	Poles: - 52+ 3.89045 +100	

4	52 + 3.89045 +10 =1 b=3.8904	0=0	101 -151
S _{1,2}	$= -b \pm \sqrt{b^2 - 4a}$	4	(2-12
Sin	-3.8904± (3.890 -20	$(4)^2 - 4(1)$)(100)
	s - 3.8904± 19.6180		:.j=1-1
	<u> </u>	1.95-	9.81.1
	-1.95+9.81), S2	7 1 5 5	
		ix:	1W 9.81
	17/1	2	
			+20
SF t	e value of kpz is high	-1.95 Th &	
Syste	n is to be Marginally	Stable.	-9.81
Root	s are in the left	half Har	ne &
on "Mar	the imaginary axis, junally Stable means to seen Stability & U	, so the chat System	System is lies
betu	sein stability a		

Case 04 (Kpz = 100, Kdz = 100)					
Put values in eq (7)					
7/0)					
Zdes(s) = 3+103.8904S + 100					
(001)(1) P - Stephen (1) (1) (100)					
Zeros = (No zeros)					
1. = 1.6.					
Poles => \$ + 103.89045+100=0					
a=1 b=103.8904 C=100					
Find the roots by using avadratic Formula					
$S_{1,2} = -103.8904 \pm \sqrt{(+103.8904)^2 - 4(0)(100)}$					
$\frac{21,2}{2} = \frac{103.810^{-1} \pm \sqrt{(4103.8104)} - 4(10/100)}{2(1)}$					
S1,2 = -103-8904 ± 101.9471					
2					
$S_1 = -0.97$ $S_2 = -102.91$					
Complex Plane:					
Complex Plant:					
414 1 474 176 040 1					
-00 + 100 +					
-102.92 state planged and of-0.97 mg &					
X X					
Both roots are in left plane, so					
the System is Stable					
IF the value of both Kno & Kdz are					
high, so the system is to be stable.					