EE302 Homework 1

Nail Tosun - 2094563 -Section 5
Electric and Electronic Engineering Departmant, METU

2018
March

1)
a)

Table 1: Routh-Hurwitz Table for part-a

s^3	1	10	0
s^2	20	400	0
s	-10	0	0
1	400	0	

There are two positive root therefore system is unstable. b)

Table 2: Routh-Hurwitz Table for part-b

s^5	1	2	3
s^4	3	6	1
s^3	$\epsilon = 0.01$	2.67	0
s^2	-794	1	0
s	2.67	1	0
1	1	0	0

There are two positive root therefore system is unstable.
c)

Table 3: Routh-Hurwitz Table for part-c

s^4	1	2	-8
s^3	-1	-4	0
s^2	-2	-4	0
s	4	0	
1	-8		

There are three positive root therefore system is unstable.

Table 4: Routh-Hurwitz Table for part-d

s^5	1	16	100
s^4	2	32	200
s^3	0	0	0
s^2			
s			
1			

Entire row is zero. Therefore i take derivative of upward equation and added its coefficents to zero row.

$$\frac{d}{ds}(2s^4 + 32s^2 + 200)$$

$$8s^3 + 64s$$

then new table become;

Table 5: Routh-Hurwitz Table for part-d ver2

s^5	1	16	100
s^4	1	8	0
s^3	8	100	0
s^2	-4.5	0	0
s	100	0	0
1	0		

4) Matlab script to finding roots;

```
p1 = [1 20 10 400];
p2 = [1 3 2 6 3 1];
p3 = [1 -1 2 -4 -8];
```

```
p4 = [1 2 16 32 100 200];
roots1 = roots(p1);
roots2 = roots(p2);
roots3 = roots(p3);
roots4 = roots(p4);
```

Results are (in 2 significant digit); polynomial 1 has roots at
$\lambda_1 = -20,47 + 0,00i$
$\lambda_2 = 0,23 + 4,41i$
$\lambda_3 = 0,23 - 4,41i$

polynomial 2 has roots at
$\lambda_1 = -2,91$
$\lambda_2 = 0,23 + 1,33i$
$\lambda_3 = 0,23 - 1,33i$
$\lambda_4 = -0,28 + 0,34i$
$\lambda_5 = -0,28 - 0,34i$

polynomial 3 has roots at
$\lambda_1 = 2.00$
$\lambda_2 = 2.00i$
$\lambda_3 = -2.00i$
$\lambda_4 = -1.00$

polynomial 4 has roots at
$\lambda_1 = 1,00 + 3,00i$
$\lambda_2 = 1,00 - 3,00i$
$\lambda_3 = -1,00 + 3,00i$
$\lambda_4 = -1,00 - 3,00i$
$\lambda_5 = -2,00$