Control Project

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1st question

- Electrical Model:
- Ri+Ldi/dt=Ein
- (Ein-Ri)/L=di/dt

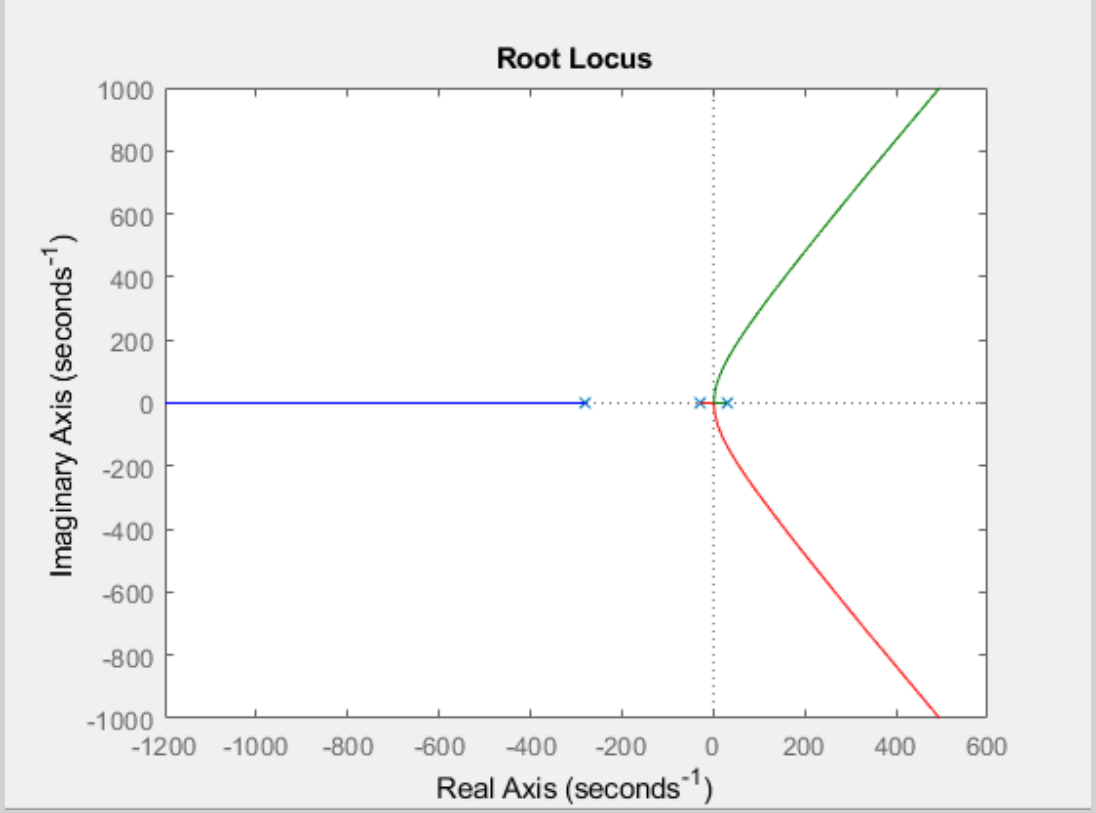
- Mechanical Model:
- Fem=mz"+mg
- Fem-mg=mz"
- Kf*i(t)^2/(d-z)^2 –mg = mz"

2nd question
part a and b with matlab

- num1=[55.5556];
- den1=[1 277.778];
- G=tf(num1,den1)

- num2=[24.525];
- den2=[1 0 -817.5];
- T=tf(num2,den2)

- sys = G*T
- A= feedback(sys,1,1);
- rlocus(A)



MATLAB Command results

G = 55.56

---

s + 277.8

T = 24.52

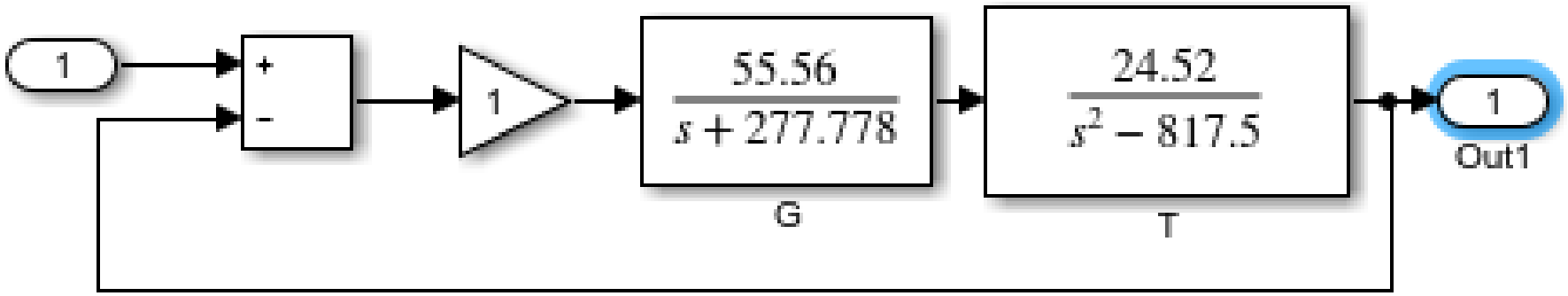
---

s^2 - 817.5

sys = 1363

---

s^3 + 277.8 s^2 - 817.5 s - 2.271e05


1
+
-
1
55.56
s + 277.778
G
24.52
s^2 − 817.5
T
1
Out1

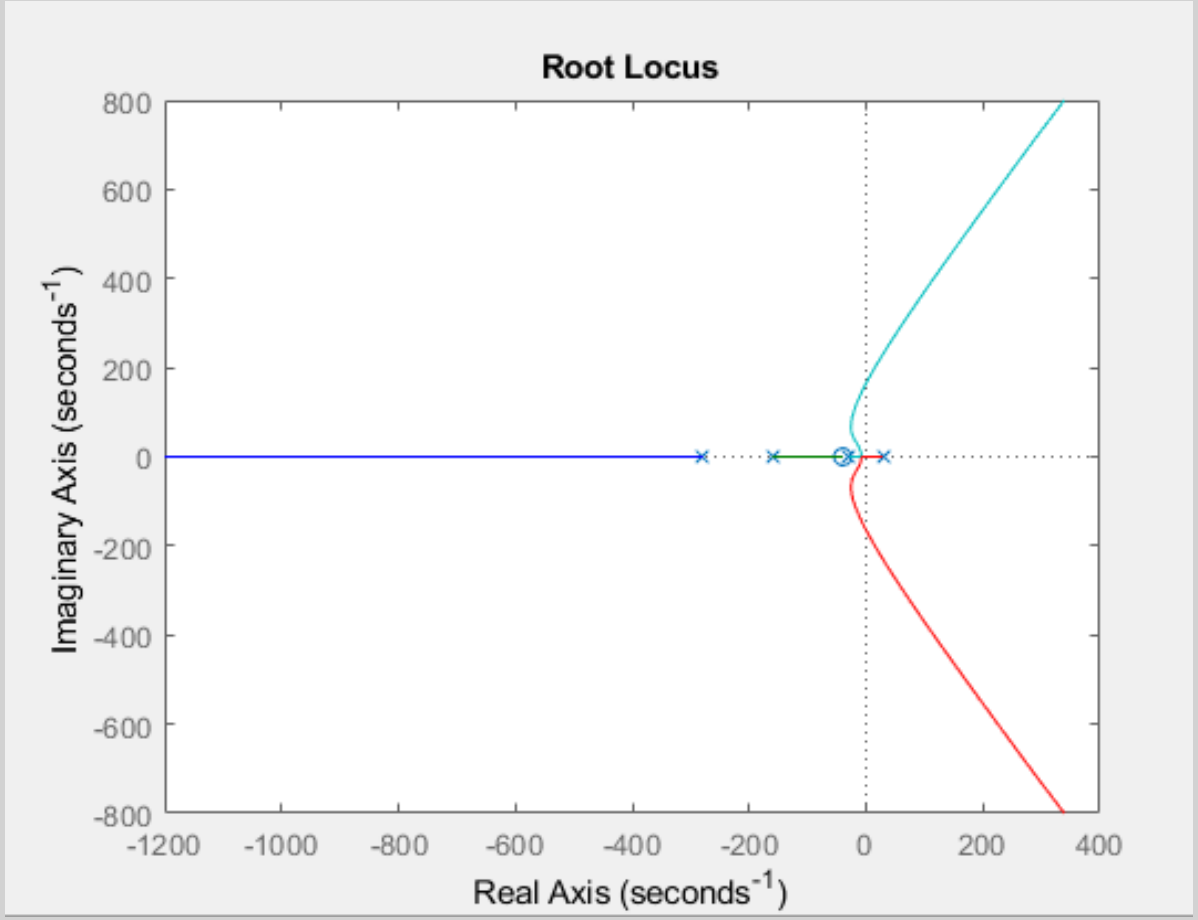
2nd question part c

- num1=[55.5556];
- den1=[1 277.778];
- G=tf(num1,den1)

- num2=[24.525];
- den2=[1 0 -817.5];

- T=tf(num2,den2)
- num3=[1 40];
- den3=[1 160];
- K=tf(num3,den3)

- sys = K*G*T
- A= feedback(sys,1,1);
- rlocus(A)



MATLAB Command results

G = 55.56

---

s + 277.8

T = 24.52

---

s^2 - 817.5

K = s + 40

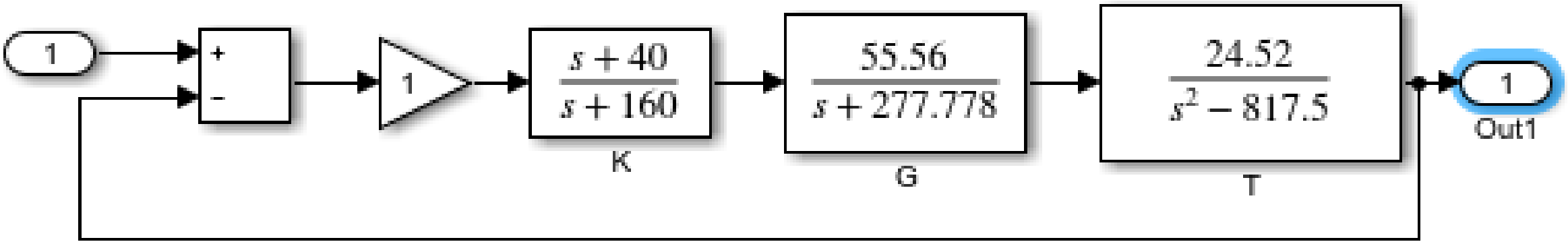
---

s + 160

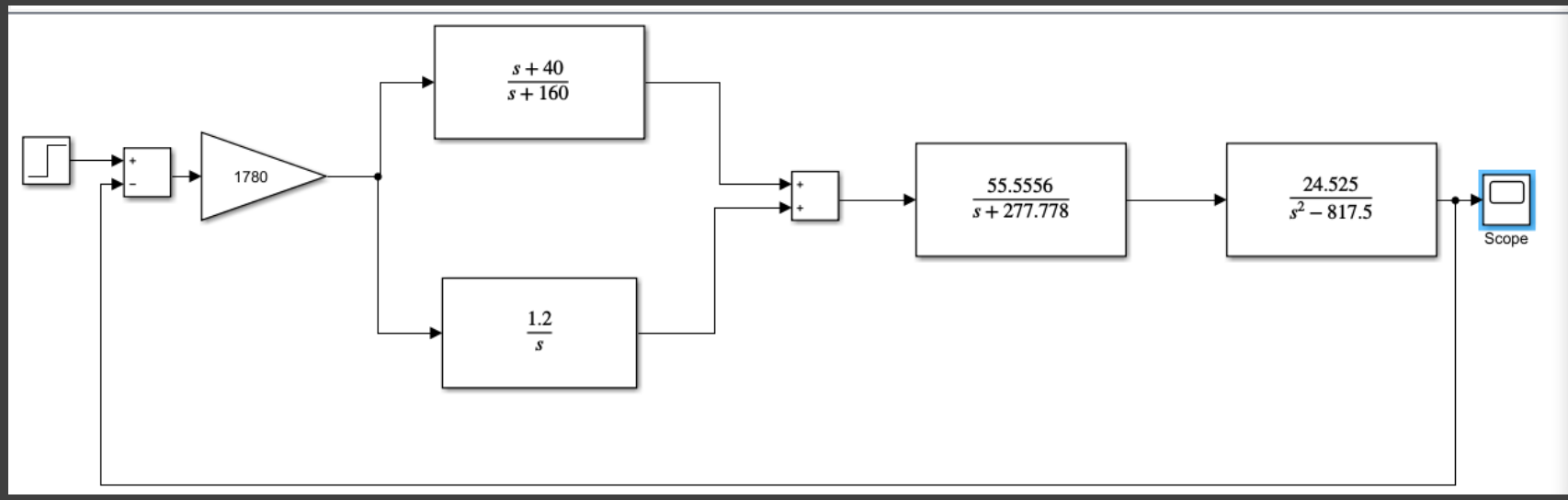
sys = 1363 s + 5.45e04

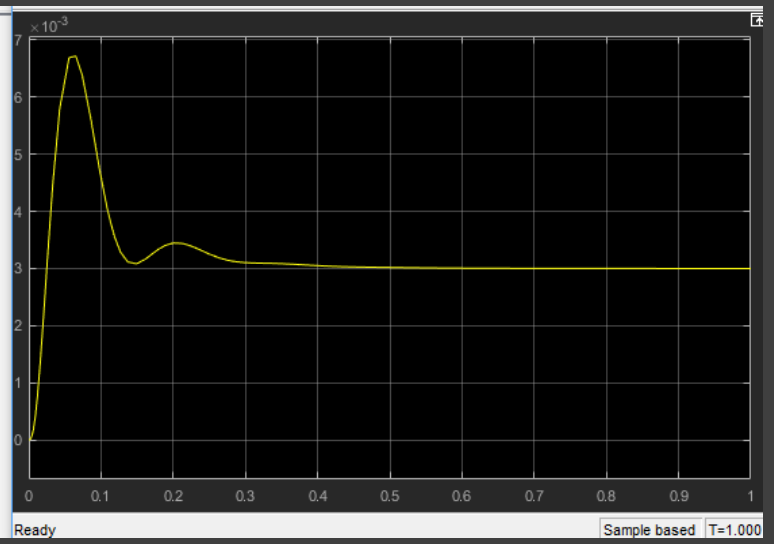
---

s^4 + 437.8 s^3 + 4.363e04 s^2 - 3.579e05 s - 3.633e07


1
+
-
1
$\frac{s+40}{s+160}$
K
$\frac{55.56}{s+277.778}$
G
$\frac{24.52}{s^2-817.5}$
T
1
Out1

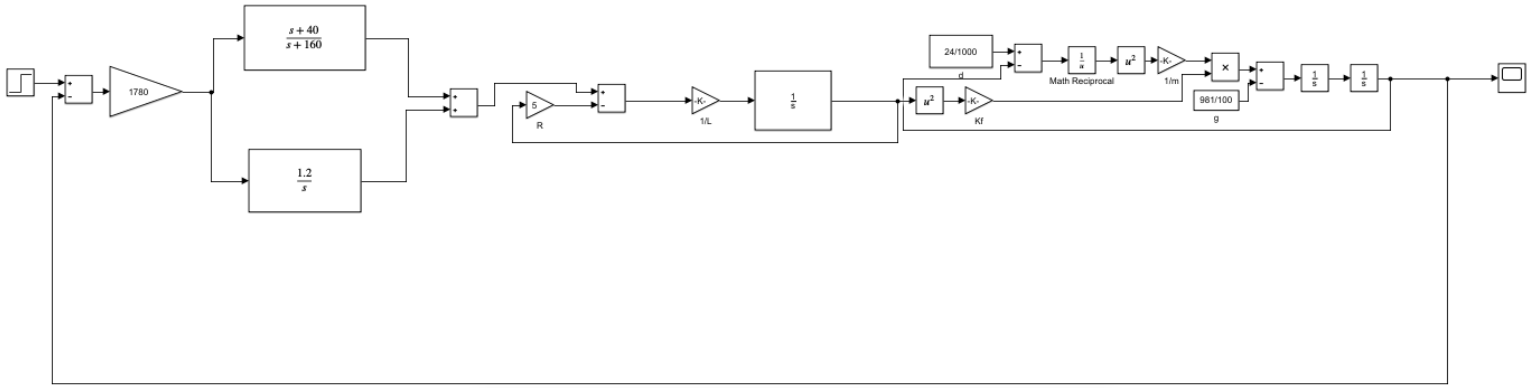
3rd question part a and b

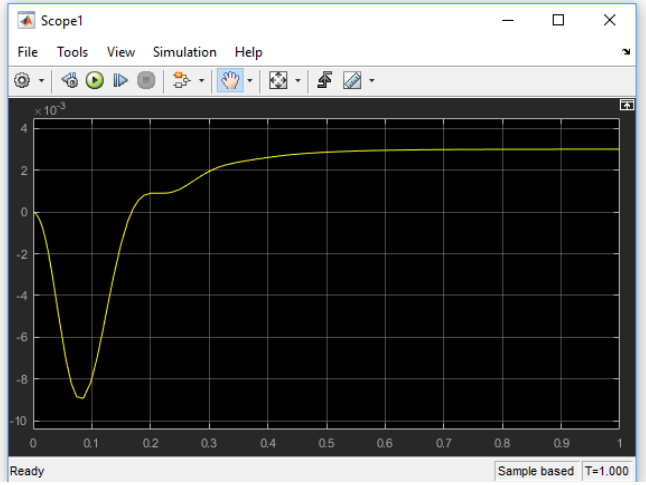




3rd question part c

- The challenging parts were the connecting the controller to the electrical part, and used math reciprocal and converting z's 2nd derivative





3rd question

part d

- For the 2b rlocus graphic, we can see unstable curve.
- 2c's stability depends on the K, it can be stable or unstable
- For the 3rd question we can say that using block diagram with mathematical models of the mechatronical circuit rather than laplace transformation makes body plot upside down. But for the 3c the error rate is much more than 3a with upsidedown version
- Note: Sir if you can copy and paste the code which is in the matlab form and save to another place, the code works well. If you just try to open code and run it, due to the file name it does not accept. So try the same code with default matlab document names. And also you have to copy past the code to the new live script. Does not work on command