

(Fall 2017) ELEC 341 Quiz #1

Instructions:

- You have **45 minutes** to complete this quiz.
- You **MAY** use a formula sheet and calculator.
- You **MUST** show your work in your booklet.
- You **MUST** write your answer on this paper.

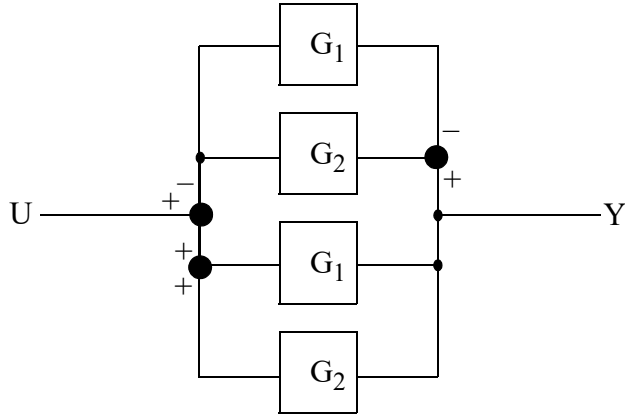
Name:

S/N:



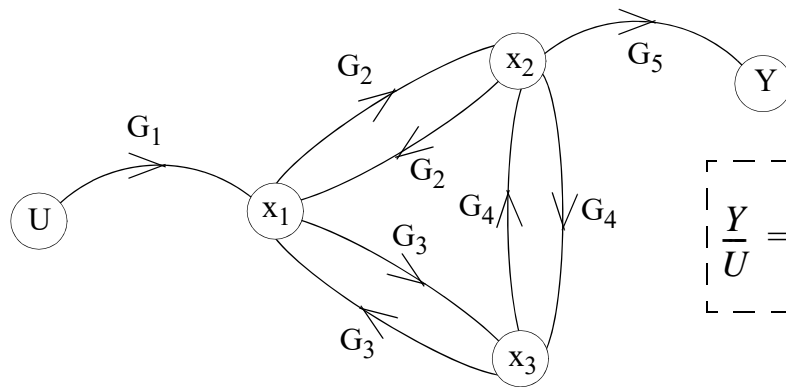
Total: 35 Marks

1 - (15 marks) Use Block Diagram Manipulation to compute the transfer function Y/U .



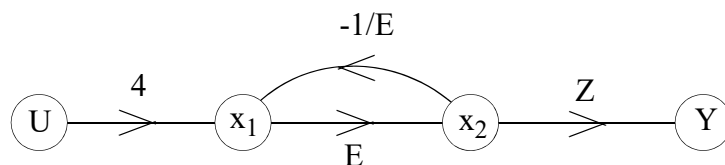
$$\frac{Y}{U} =$$

2 - (15 marks) Use Mason's Gain Formula to compute the transfer function Y/U .



$$\frac{Y}{U} =$$

3 - (5 marks) Use any method to compute the transfer function Y/U .



$$\frac{Y}{U} =$$

4 - (3 marks) Bonus : Question #3 was:

- ☐ Reasonable & fair
- ☐ Too difficult
- ☐ Too easy

Instructions:

- You have **45 minutes** to complete this quiz.
- You **MAY** use a formula sheet - **NO CALCULATOR**.
- You **MUST** show your work in your booklet.
- You **MUST** write your answer on this paper.

(Fall 2017) ELEC 341 Quiz #2

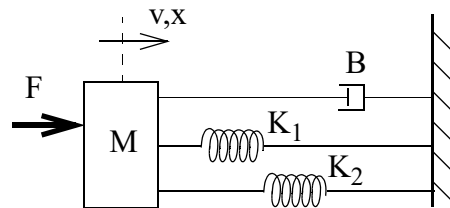
Name:

S/N:

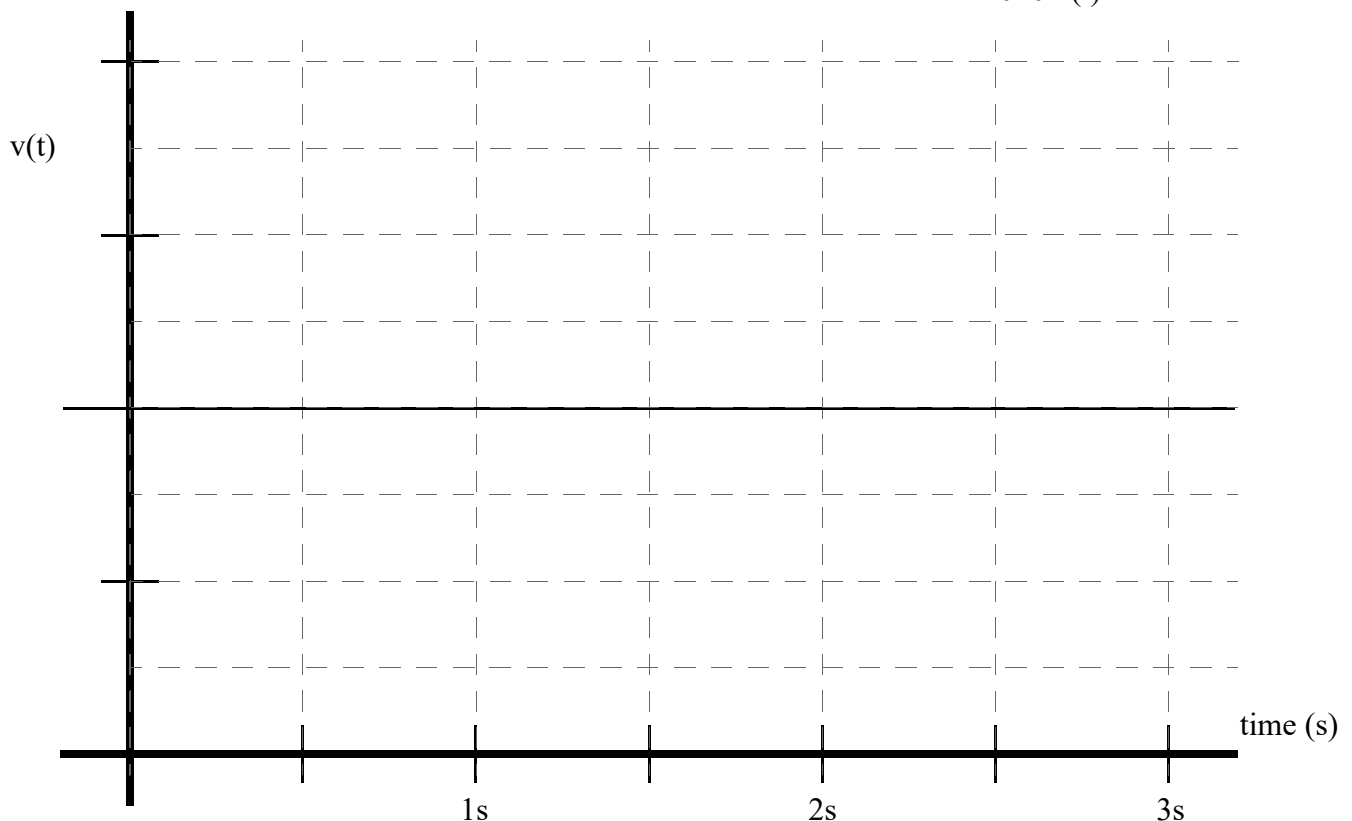
Total: 35 Marks

Use **performance measures** to sketch the response of the following mechanical system, where the input is FORCE and the output is POSITION x . Sketch the envelope as well, if applicable.

- Align the final value with the thin solid line.
- Indicate all important values on the x and y -axes.
- Use the mathematical “Hints” below to improve the accuracy of your sketch.
- Plotting the inverse Laplace transform of the response will not produce a very accurate result when done by hand. **USE PERFORMANCE MEASURES INSTEAD.**



$$\begin{aligned} M &= 2 \\ K_1 &= 20 \\ K_2 &= 6 \\ B &= 8 \\ F &= 1040 u(t) \end{aligned}$$



Hints:

$$\begin{aligned} \pi - \tan^{-1}(1) &\approx 2.4 & e^{-2\pi/3} &\approx 0.12 \\ \pi - \tan^{-1}(1.5) &\approx 2.1 & e^{-\pi/2} &\approx 0.21 \\ \pi - \tan^{-1}(2) &\approx 2 & e^{-\pi/3} &\approx 0.35 \end{aligned}$$

} you will only need 1 or 2 or these

(Fall 2017) ELEC 341 Quiz #3

Instructions:

- You have **45 minutes** to complete this quiz.
- You **MAY** use a formula sheet - **NO CALCULATOR**.
- You **MUST** show your work on this paper.
- You **MUST** write your answer on this paper.

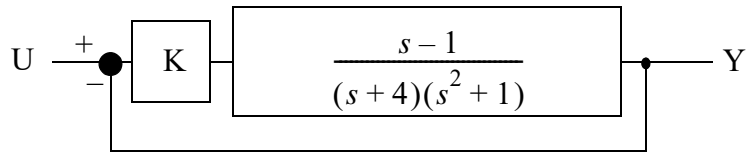
Name:

S/N:

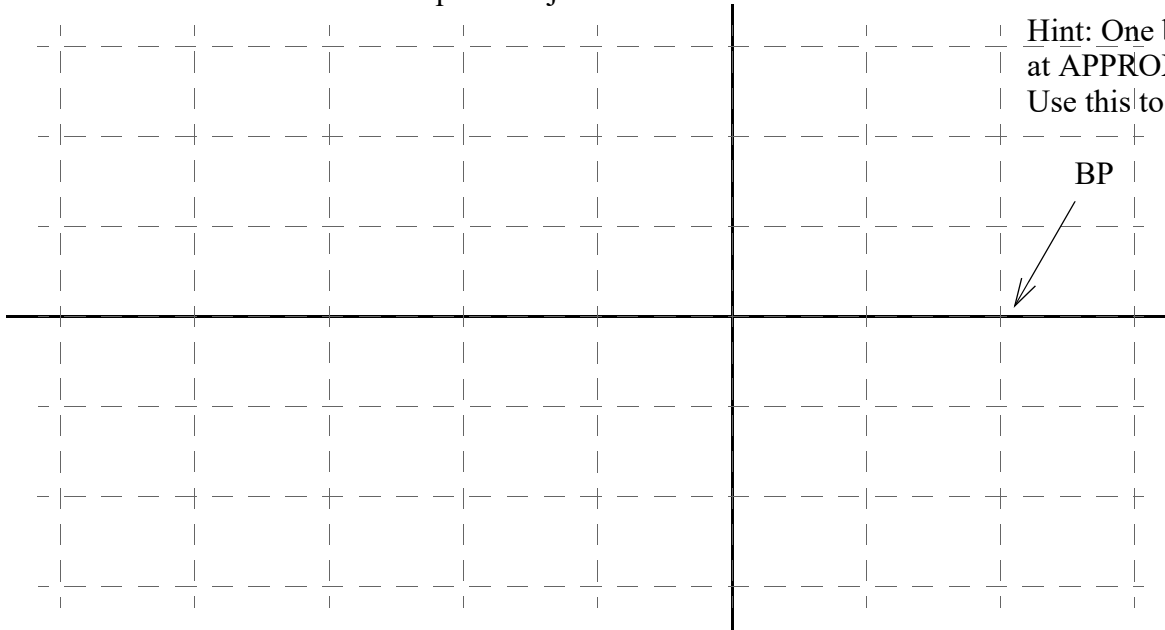
Total: 35 Marks

5 - (10 marks) For the following system, use the Routhe-Hurwitz criterion to find the values of K for which the system is stable.

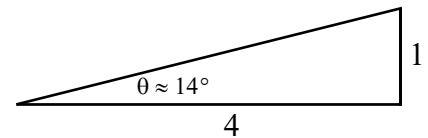
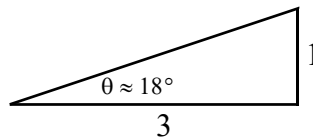
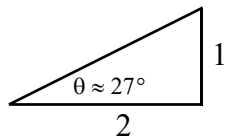
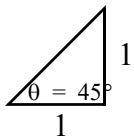
6 - (25 marks) Sketch the root locus. Show your work on this paper. Compute all values that help you to do the most accurate possible job.



Hint: One breakpoint occurs at APPROXIMATELY $s = +2$. Use this to compute the others.



Hint:



(Fall 2017) ELEC 341 Quiz #4

Instructions:

- You have **45 minutes** to complete this quiz.
- You **MAY** use a formula sheet - **NO CALCULATOR**.
- You **MUST** show your work on this paper.
- You **MUST** write your answer on this paper.

Name:

S/N:

Total: 35 Marks

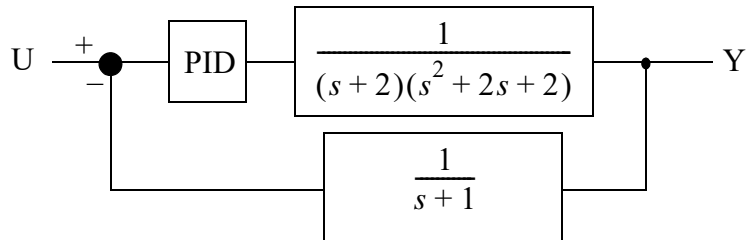
7 - (30 marks)

For the following system, design a PID controller that:

- cancels 2 open-loop poles
- has the **HIGHEST POSSIBLE** gain which is equal to half of the ultimate gain ($K_u/2$)

8 - (5 marks)

Sketch the root locus of the controlled system. Show your work. Compute all necessary values but if there is a breakpoint, just estimate it.



Hint:

