

Linear Control Systems

Problems Series 2

Question 1: Consider the following circuit

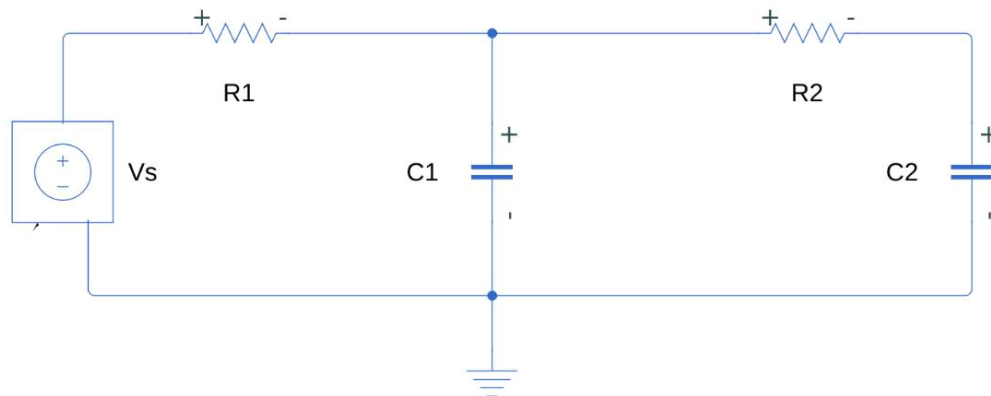


Figure 1: first question circuit

Where $R_1 = 100K\Omega$, $R_2 = 20K\Omega$, $C_1 = 10\mu F$, $C_2 = X\mu F$, where X is the last digit of your student number.

- 1) Calculate the transfer function of the circuit above using MATLAB when the output voltage V_o is V_{C2} .
(Hint: refer to tutorial videos, part 4).
- 2) Plot the step response of the circuit using its transfer function.
- 3) Determine the *DC* gain of the circuit.
- 4) Identify the poles of this system.
- 5) Derive the state-space representation of the system from its transfer function.

Question 2: Consider the following transfer functions,

$$G_1 = \frac{1}{s - 3}$$

$$G_2 = \frac{1}{s^2 + 1}$$

- 1) Calculate their *DC* gain using MATLAB.
- 2) Plot their step responses. Is your answer in part 1, correct?
- 3) Stabilize the first transfer function using a gain *K* and unit feedback, then plot the step response of the closed-loop system. (Hint: You can do this manually or using the `feedback()` function in MATLAB.)

Attention:

- ✓ Try to solve the exercises on your own.
- ✓ There is no need to solve the questions by hand; use MATLAB only.
- ✓ Upload the report file along with your code file(s) as a compressed file on the LMS.
- ✓ The compressed file name should follow the format below.
MATLAB_HW2_StudentFamily_StudentNumber.rar (.zip)

Good luck!

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