

EE 230
 Assignment 3
 Spring 2010

Problem 1 A system has a transfer function with no zeros, a single pole at $s = -6$, and a dc gain of 9.

- Write the transfer function
- Determine the response to a step of $5u(t)$. Assume the output prior to $t = 0$ is 0.

Problem 2 A linear system has a transfer function of

$$T(s) = 20 \frac{s + 2}{s^2 + 3s + 9}$$

- Determine the poles and zeros of the transfer function
- Plot the poles and zeros in the s-plane

Problem 3 Determine which of the following transfer functions correspond to a stable system. State how you drew the conclusion.

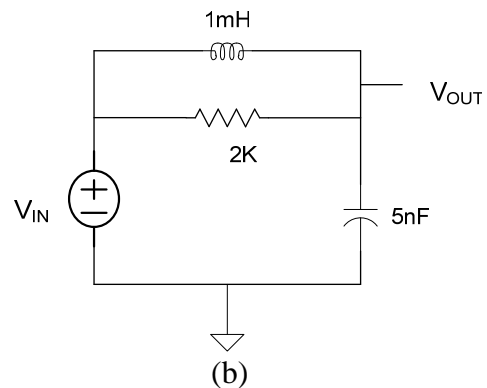
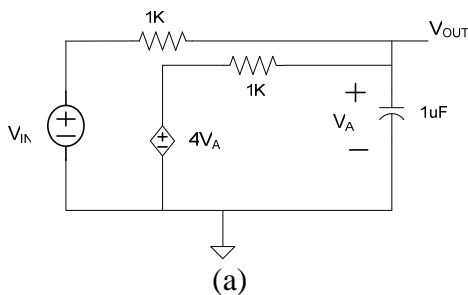
a)
$$T(s) = 10 \frac{(s + 1)(s - 1)}{(s + 8)(s - 2 + 2j)(s - 2 - 2j)}$$

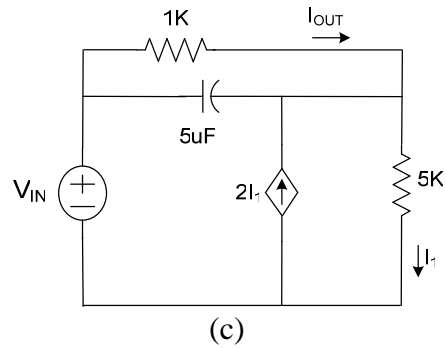
b)
$$T(s) = 10 \frac{s^2 + 3s + 18}{s^3 + s^2 + s + 6}$$

c)
$$T(s) = \frac{3}{s + 3} + \frac{9}{s + 20} - \frac{4}{s + 1}$$

d)
$$T(s) = \frac{10}{s + 10}$$

Problem 4 Determine which of the following circuits are stable. State how you drew the conclusion





Problem 5 A system has transfer function $T(s) = \frac{5}{s + 2}$.

- a) If a step input of $4u(t)$ is applied at the input, determine the final output.
- b) Determine the 3dB band edge of this system

Problem 6 Design a circuit that has a voltage transfer function with one pole at $s = -5$. You may use resistors, capacitors, inductors and both dependent and independent sources in your design.

Problem 7 Design a circuit that has a dc gain of $1/3$ and a pole at $s = -10$. You may use resistors, capacitors, inductors and both dependent and independent sources in your design.

Problem 8 Design a circuit that has a lowpass transfer function with a 3dB band edge of 30Hz. You may use resistors, capacitors, inductors and both dependent and independent sources in your design.

Problem 9 Problem 1.39 of Sedra and Smith

Problem 10 Problem 1.41 of Sedra and Smith