

1. (10%) Please find the transfer function, $V_o(s)/V_i(s)$, for the circuit given in Figure 1.

Assuming the amplifier A is ideal.

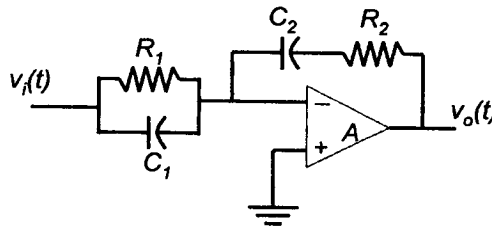


Figure 1

2. (20%) For the system shown in Figure 2, $R(s)$ and $C(s)$ represent input and output, respectively. J , B and K are the system parameters. Please answer the following questions:

- (a) (5%) If we can express the error $E(s)$ as $E(s) = X(s)R(s)$. What is the $X(s)$?

(Hint: express as a function of s , J , B and K)

- (b) (5%) Set $\zeta = \frac{B}{2\sqrt{KJ}}$, and $\omega_n = \sqrt{\frac{K}{J}}$. What is the steady state error e_{ss} for a unit ramp input $r(t) = t$? Use ζ and ω_n to express e_{ss} .

- (c) (5%) In order to shorten the settling time of the system (closed-loop), is it a good idea by adjusting the parameter K ? Why?

- (d) (5%) Regarding the three parameters J , B and K , which one or two or all of them will affect the maximum overshoot of the system (closed-loop)? Why?

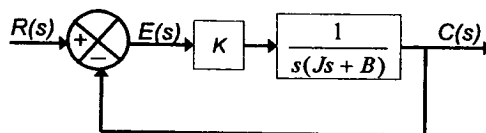


Figure 2