ELG4157: Assignment for Bonus Test 2

- List the major advantages and disadvantages of closed-loop control systems.
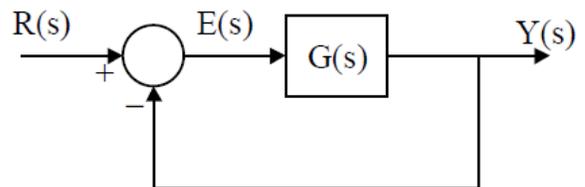
Advantages	Disadvantages

- For the system shown in the following figure, what are the steady-state errors when a unit-step input is applied to the following open-loop transfer functions G(s):
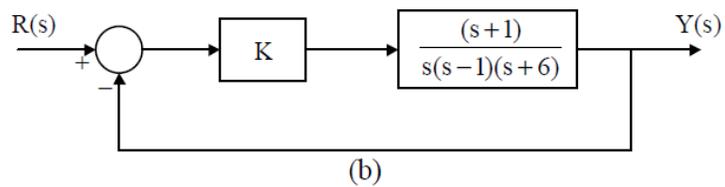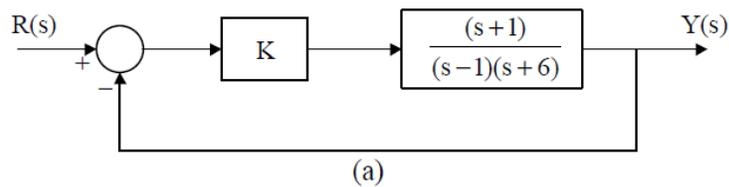
(a) $G(s) = \dfrac{10}{(s+1)(s+2)}$
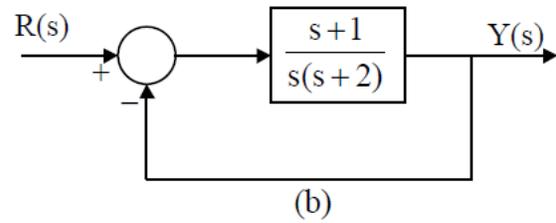
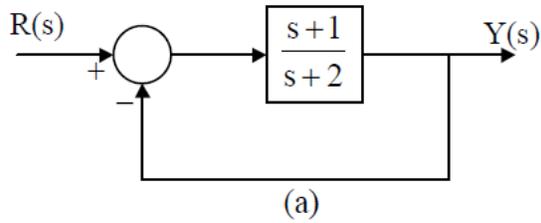(b) $G(s) = \dfrac{6(s+3)}{(s+6)(s+2)}$

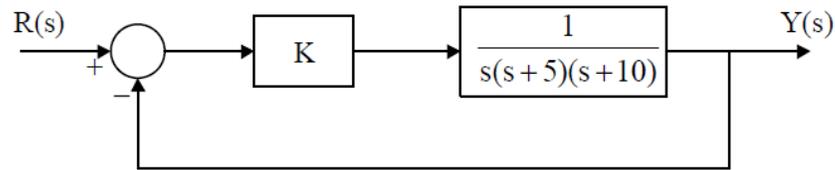(c) $G(s) = \dfrac{10}{s(s+1)(s+2)}$

- What are the type numbers for the systems shown in the following figures?

(a)

(b)

- Find the static position error constants and steady-state errors, respectively, of the systems shown in the following figures for a unit-step input.
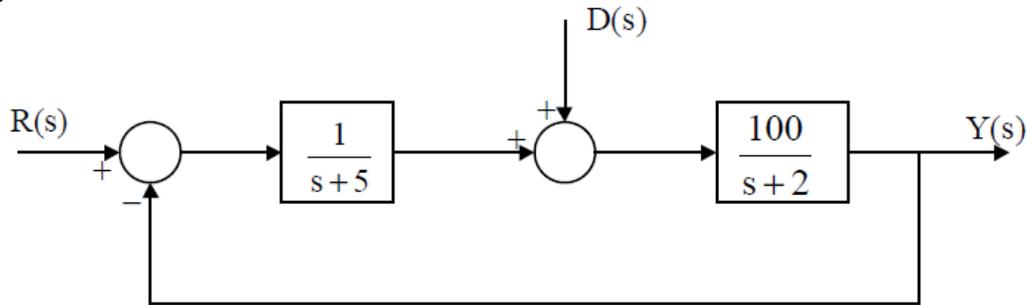
R(s) → ⊕ → [$\frac{s+1}{s+2}$] → Y(s)

(a)

R(s) → ⊕ → [$\frac{s+1}{s(s+2)}$] → Y(s)

(b)

- For the system shown in the following figure:

R(s) → ⊕ → [K] → [$\frac{1}{s(s+5)(s+10)}$] → Y(s)

(a) What value of K will yield a steady-state error in position of 0.01 for an input of $r(t) = t/10$?
(b) What is the value of K_v for the value of K found in (a)?

- Find the total steady-state error due to a unit-step input and a unit-step disturbance in the system shown below.

D(s)

R(s) → ⊕ → [$\frac{1}{s+5}$] → ⊕ → [$\frac{100}{s+2}$] → Y(s)

- A temperature control system of a chemical fluid in a tank is shown, where R (s) is the desired temperature, Y (s) the actual temperature and 'a' is a constant related to the mass in the tank. Find the open-loop and closed-loop sensitivity of this system to changes in parameter **a** due to chemical reactions ageing. How would you reduce the sensitivity at low frequencies (s→0)?

R(s) → ⊕ → [$\frac{K}{s+a}$] → Y(s)