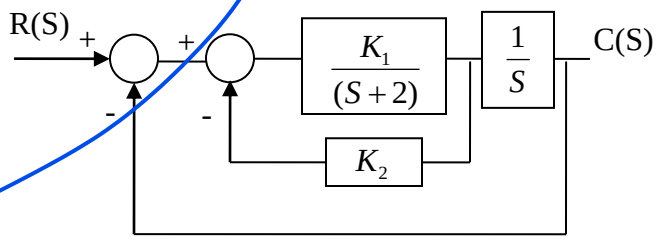
Cairo University
Faculty of Engineering
Computer Dept.

ELC 3252
CONTROL ENGINEERING
3rd Year - 2022

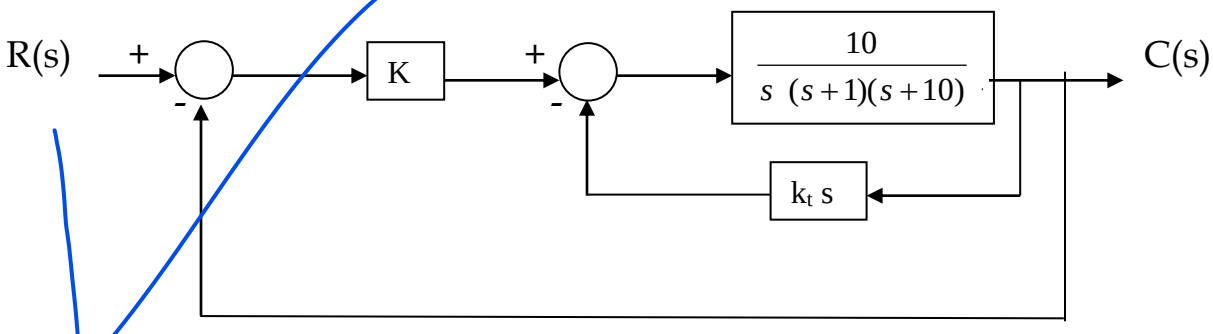
SHEET 4
Time Response

[1] Referring to the system shown in figure, determine the values of K_1 and K_2 such that the system has a maximum overshoot in unit step response is 25% and the peak time is 2 sec.



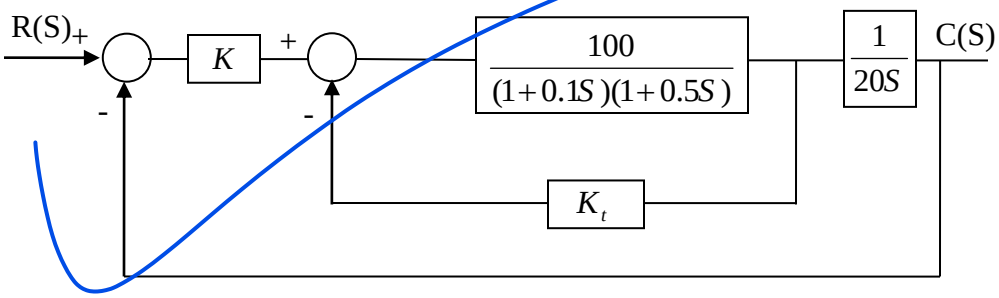
[2] The block diagram of a DC motor control system with tachometer feedback is shown in figure 4. Find the values of K and K_t so that the following specifications are satisfied:

- k_v =1
- Dominant characteristic equation roots corresponding to a damping ratio of approximately 0.707



k= 2.23
kt = 1.23

[3] For the control system shown in the figure, determine the values of K and K_t such that the output has a maximum overshoot 4.3% and the rise time is approximately 2 sec. with the values of K and K_t obtained, find the steady state error when the input is a unit ramp function.



[4] The roll control autopilot of a jet fighter is shown in figure 1 .the goal is to select a suitable K so that the response to a unit step command $\Phi_d(t)$ will provide a response $\Phi(t)$ that is a fast response and has an overshoot of less than or equal *9.5%:*

a) Using the concept of dominant poles, find a suitable value of K that will achieve the desired transient response. Predict the transient response of the system (i.e. get t_r t_p and t_s).

b) Find the static error coefficients of the system. Evaluate the value of K that gives minimum steady state error for a unit ramp input.

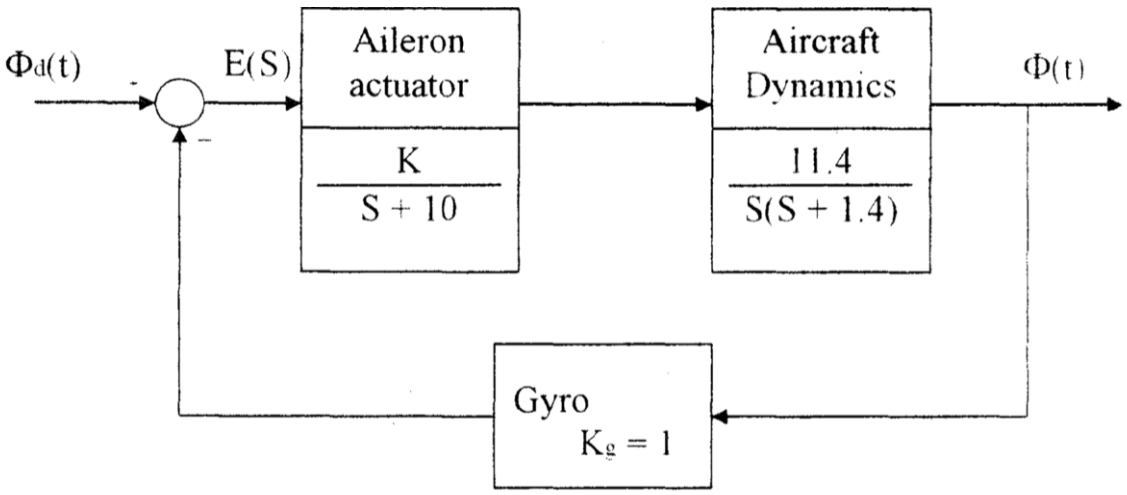


Figure (1) Roll angle control