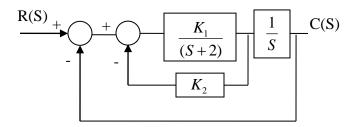


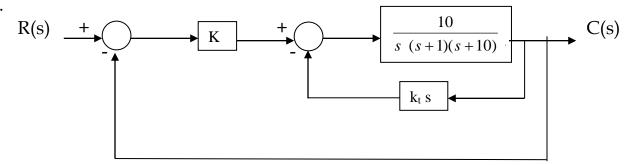
ELC 3252 CONTROL ENGINEERING 3rd Year - 2022

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.



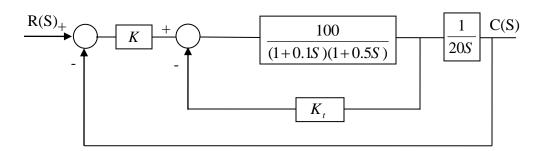
- [2] The block diagram of a DC motor control system with tachometer feedback is shown in figure 4. Find the values of K and K_t so that the following specifications are satisfied:
 - $k_v = 1$
 - Dominant characteristic equation roots corresponding to a damping ratio of approximately 0.707



$$k = 2.23$$

 $kt = 1.23$

[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 tp 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.

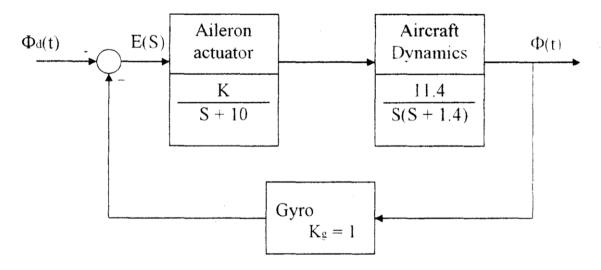


Figure (1) Roll angle control