Zewail City for Science and Technology
Nanotechnology Engineering Program
Quiz 2

NANENG 512
Applied Digital Control and Drives
Fall 2020

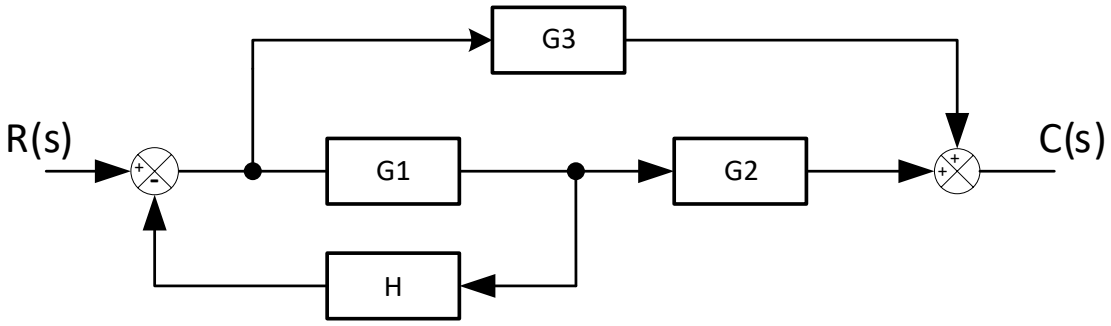
Name: ID#:

Duration: 30 mins.

Problem 1

Prove that the transfer function of the following system is

$$\frac{C(S)}{R(s)} = \frac{G_1G_2 + G_3}{1 + G_1H}$$



Let $G_1 = \frac{1}{s(s+2)}$ $G_2 = 3$ $G_3 = \frac{1}{s}$ $H = 5$

1- Find: Rise time t_r and maximum overshoot M_p

2- Add controller G_c to the system and consider it a standard feedback system. Design G_c to decrease the maximum overshoot M_p to 10% and achieve a settling time t_s of 2 $seconds$.

3- What is the steady-state error when the input is a unit step after adding G_c?

Hint: $t_r = \frac{\pi-\theta}{\omega_n\sqrt{1-\zeta^2}}$ $M_p = e^{\frac{-\pi\zeta}{\sqrt{1-\zeta^2}}}$ $t_s = \frac{4}{\zeta\omega_n}$