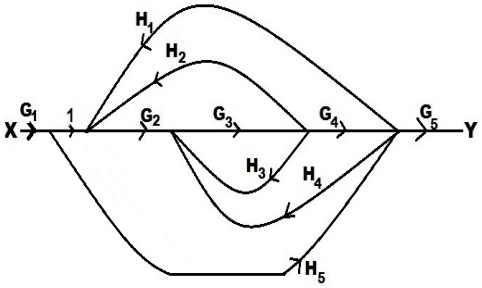
Name:
ID. No.

Eskişehir Osmangazi University - Electrical Engineering Department
Fundamentals of Control Systems- Midterm Examination - Spring 2015

Duration: 70 minutes; **Allowed**: An A4 size two sided formula sheet and a calculator; **Directions**: All answers must be written below the questions. Anything written elsewhere won't be graded. Use the back side of the exam sheet if you need scratch paper.

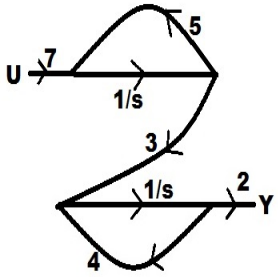
Question 1.

25 pts. Given the LTI systems with their transfer functions below, find the transfer function $Y(s)/X(s)$



$$\frac{Y(s)}{X(s)} = \frac{G_1G_2G_3G_4G_5 + G_1G_5H_5(1 - G_2G_3H_2 - G_3H_3)}{1 - G_2G_3H_2 - G_2G_3G_4H_1 - G_3H_3 - G_3G_4H_4}$$

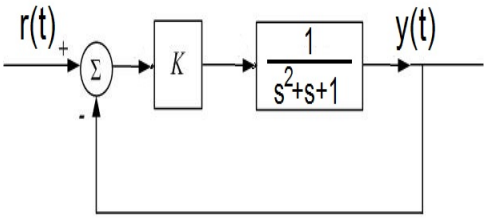
Question 2.



25 pts. Given the LTI systems with their transfer functions on the left write the transfer function $\frac{Y(s)}{U(s)}$.

$$\frac{Y(s)}{U(s)} = \frac{\frac{42}{s^2}}{1 - (\frac{5}{s} + \frac{4}{s}) + (\frac{5}{s}\frac{4}{s})} = \frac{42}{s^2 - 9s + 20}$$

Question 3.



For the configuration on the left, let $K = 3$, *and let* $r(t)$ *be the unit step function.*

(a) 10 pts. What is the steady state value of $y(t)$. $\frac{3}{4}$

(b) 15 pts. What is the peak value of $y(t)$. 1.0832

Question 4.

25 pts. Consider a system with input out relationship $\frac{d^2y}{dt^2} + \frac{dy}{dt} = u$.

(a) Write the transfer function $\frac{Y(s)}{U(s)}$ $\frac{1}{s^2 + s}$

(b) Find the steady state unit step response of the system. ∞

(c) Find the steady state unit impulse response of the system. 1

Good Luck
A. Karamancıoğlu