# UNIVERSITY OF VICTORIA

## MIDTERM – OCTOBER 2003

## ELEC 360 – CONTROL THEORY AND SYSTEMS I

## SECTION F01

**INSTRUCTOR:** Dr. P. Agathoklis **DATE:** October 28, 2003

**DURATION:** 50 minutes

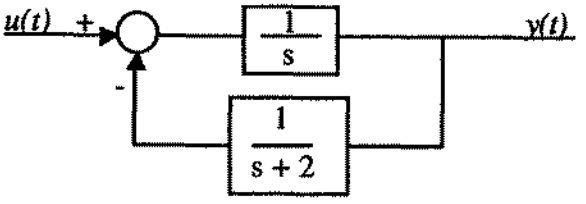
**TO BE ANSWERED IN BOOKLETS**

**ANSWER ALL QUESTIONS**

**TWO PAGES OF HANDWRITTEN NOTES AND PHOTOCOPIES OF TABLES ARE ALLOWED.**

**Marks**

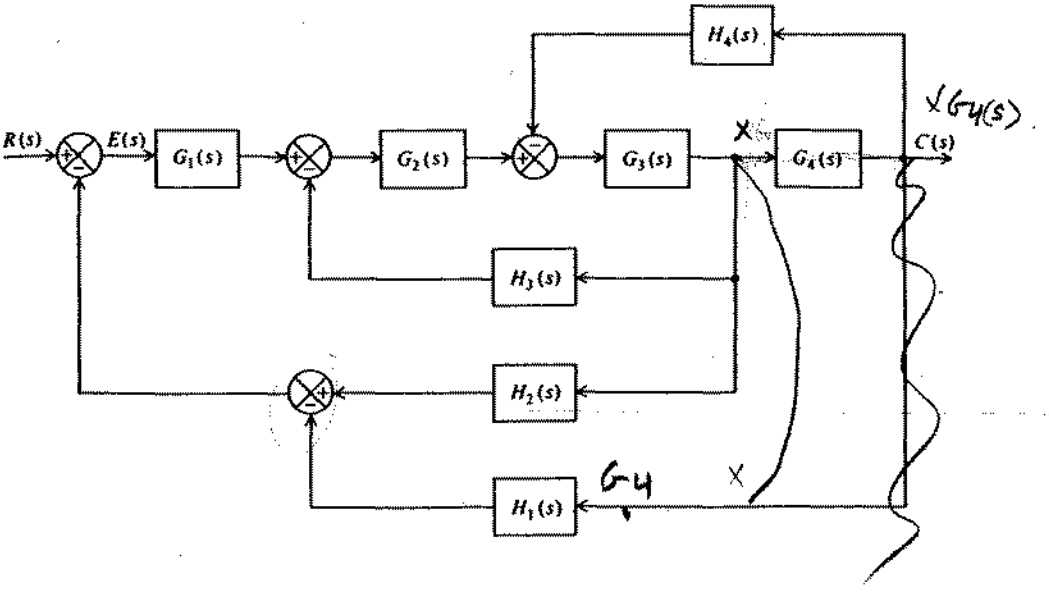
**(4)** 1. Consider a system given by:



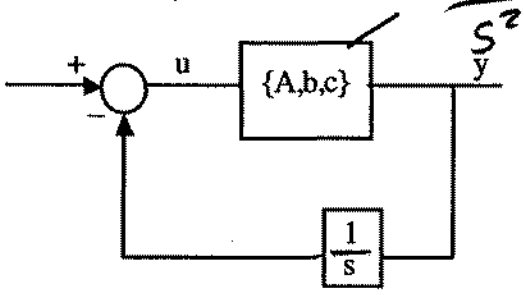

Find the response $y(t)$ to an input

$$u(t)=\begin{cases}2 & for\ 1\le t\le 2\\ 0 & else\end{cases}$$

**(5)** 2. Find the transfer function C(s)/R(s) for the following system



**(6)** 3. Consider a system




where {A,b,c} is given by:

$$\dot{x} = \underset{A}{\begin{bmatrix} -2 & 0 \\ 2 & -a \end{bmatrix}} x + \underset{B}{\begin{bmatrix} 1 \\ 6 \end{bmatrix}} u$$

$$y = \underset{C}{[0 \quad 1]} x$$

Find

1. For what values of the parameter a is the closed-loop system stable.
2. For what values of a is the steady-state error less than 0.3 for a ramp input.

**(6)** 4. Consider a system for the following transfer function in the feed-forward path:

$$G(s) = K^* \{(s+5) / [(s-1)(s+3)]\}$$

and a negative unity feedback path.

1. Sketch the root-locus for the poles of the closed-loop system when K goes from 0 to infinity.
2. Discuss the performance (transient part using the step response and steady-state part) of the closed-loop system when K goes from 0 to infinity.

**END**