

# MIDTERM EXAMINATION - 1998

## ELEC 360 - CONTROL THEORY AND SYSTEMS: I

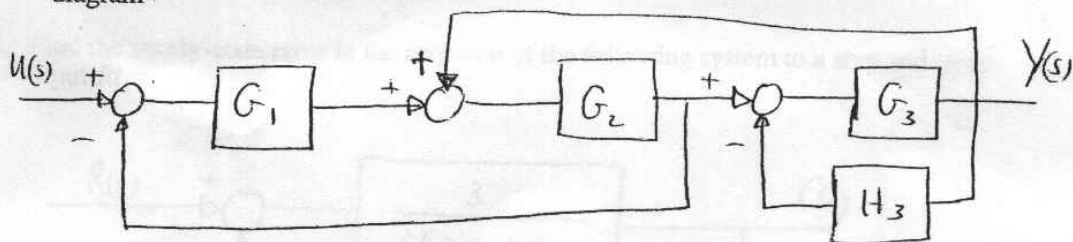
2 pages of handwritten notes allowed  
and photocopies of transform tables permitted

TIME: 40 minutes

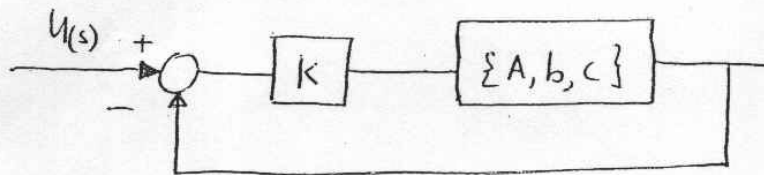
To be answered in booklets

### Marks

- (4) 1. Find the transfer function between  $Y(s)$  and  $U(s)$  for the system given by the following diagram



- (4) 2. Consider the system described by



Where

$$A = \begin{bmatrix} -4 & 5 \\ 1 & 0 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad C = [1 \quad 2]$$

For what values of  $K$  is the closed-loop system stable?

Marks

- (2) 3. Find a state-space description for

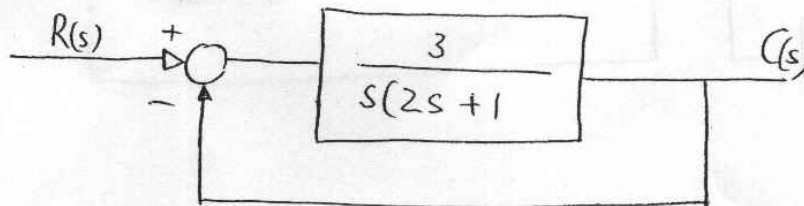
$$G(s) = \frac{4s+6}{s^3+3s^2+2s+1}$$

- (4) 4. Sketch the root-locus for

$$G(s) = \frac{s+1}{s^2(s+4)}$$

Discuss the effect of changing  $K$  from 0 to  $\infty$  on the step response of the closed-loop system.

- (3) 5. Find the steady-state error in the response of the following system to a step and ramp input  $R(s)$ .



END