



Islamic University of Gaza
Electrical Engineering Department
EELE 3360 Control Systems
Final Exam
October, 17, 2010

Dr. Basil Hamed

Exam Time 1:00-3:00

Name	
Student ID	
Grade	

GOOD Luck

1. a) A system is represented by State equation; Find the range of k where the system is stable (6 PT.)

$$\dot{\underline{x}} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -k & -3 \end{bmatrix} \underline{x} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

1. b) Given MIMO system shown in the figure below find;

i. State Space Model

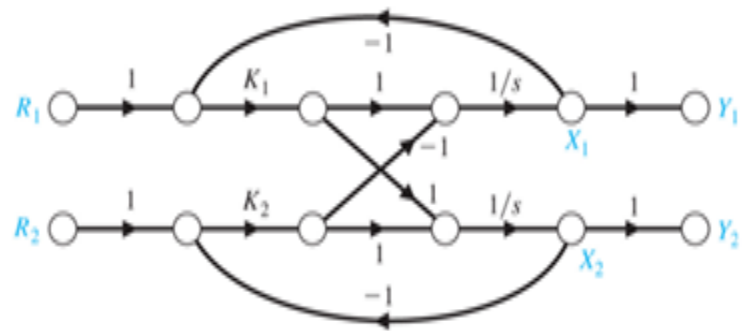
(4 PT.)

ii. Find the characteristic equation

(2 PT.)

iii. Determine the state transition matrix for $k_1=1$, and $k_2=1$

(4 PT.)



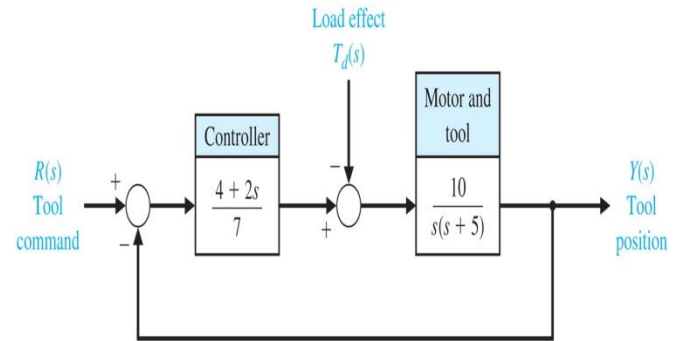
2. A machine tool is designed to follow a desired path so that

$$r(t) = (1-t) u(t)$$

The machine tool control system is shown in the figure below.

i. Determine the steady-state error when $r(t)$ is the desired path as given and $T_d(s)=0$ (5 PT.)

ii. If the desired input is $r(t) = 0$, find the steady state error when $T_d(t)$ is unit step (5 PT.)

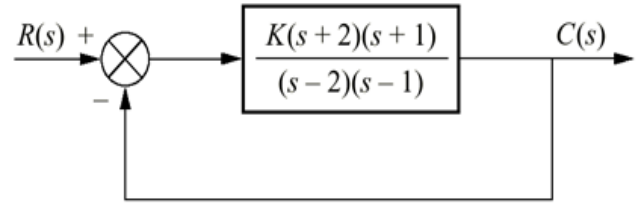


3. For the system shown in figure below, do the following:

i. Sketch the root locus. (6 PT.)

ii. Find the $j\omega$ -axis crossing and the gain, k , at the crossing. (3PT)

iii. The value of k that yield a stable system with a pair of second order poles have $\zeta=0.707$, $T_s=4$ sec. (4 PT.)



4. For given system in the figure, find

- Signal Flow Graph (4 PT.)
- Transfer Function using Mason Gain Formula.(7PT.)

