

**PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING**

Final Examination: Semester 2

Academic Year: 2005

Date: February 27, 2006

Time: 9:00-12:00

Subject: 226-331: Industrial Automatic Control

Room: หัวหูน

ทฤษฎีในการสอบ โทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

Instructions

- There are 5 questions in 10 pages.
- Attempt all questions and write the answer in this exam paper.
- Dictionary and a calculator without programming capability are allowed.
- Total score is 100.

Name:	Student ID.....
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Question #	Full Score	Assigned Score
1	20	
2	20	
3	15	
4	25	
5	20	
Total	100	

Asst. Prof. Somchai Chuchom

Question #1 (20 marks) Briefly explain the following questions.

1.1 A servomechanism is

.....

1.2 The manipulated variable (m) is

.....

1.3 What are the two main factors that affect the response of a control system?

.....

1.4 What is overshoot? How to reduce it?

.....

1.5 Specify the parameters indicating the performance of the control system at steady state.

.....

1.6 What are the dominant poles?

.....

1.7 How is the system sensitivity important?

.....

1.8 BIBO stability means

.....

1.9 Characteristic equation is.....

.....

1.10 How to get rid of external disturbances for the control system?

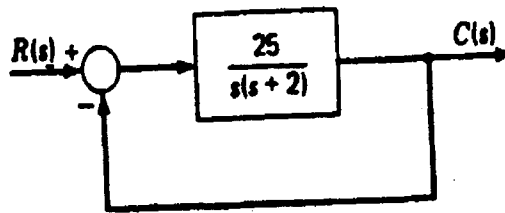
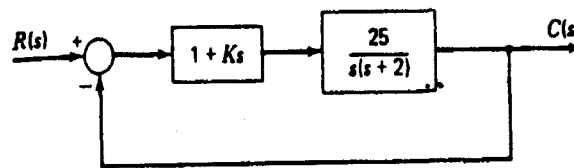
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Question #2 (20 marks)

2.1 Find the response, $c(t)$, of the system shown in Figure 2.1 when input, $r(t)$, is a unit step function with all initial conditions are zero.

2.2 If the Derivative controller is added into the system as shown in Figure 2.2. Find the value of K that provides the system with damping ratio (ξ) of 0.5.

**Figure 2.1****Figure 2.2**

Question #3 (15 marks)

Consider the control system shown in Figure 3 and give suggestion on the design in order that the steady state error is minimum when applying the unit step input.

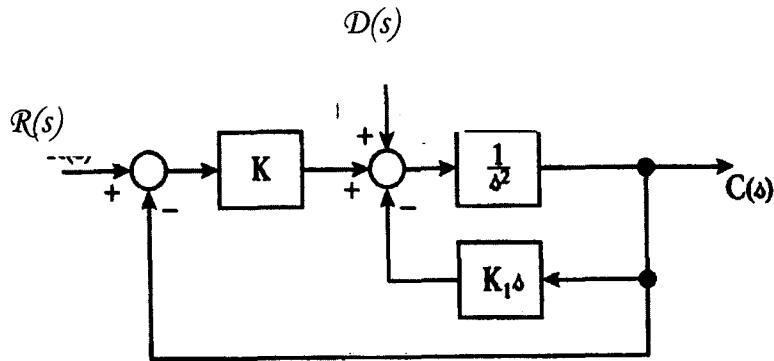


Figure 3

Question # 4 (25 marks)

Consider a unity feedback system with $G(s) = \frac{K(s+1)}{s^2 + 4s + 5}$

- 4.1 Find the range of K that makes the system stable.
- 4.2 Sketch the root locus of the system.

Question # 5 (20 marks)

5.1 Compare the advantages and disadvantages of the hydraulic controllers to those of pneumatic controllers.



5.2 A schematic diagram of a hydraulic controller 1, and its block diagram are shown in Figure 5-2-1a) and Figure 5-2-1b), respectively. Also, a schematic diagram of a hydraulic controller 2, and its block diagram are shown in Figure 5-2-2a) and Figure 5-2-2b), respectively. What types of the control actions the controller 1 and controller 2 are? Comment on the performance of each controller. (Hint: performance can be the accuracy, the speed of response, stability and etc.)

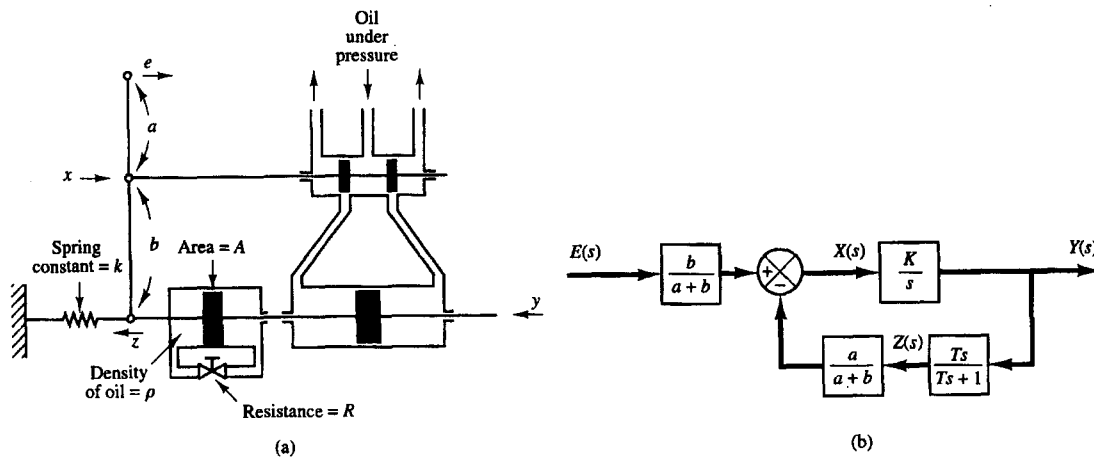


Figure 5-2-1

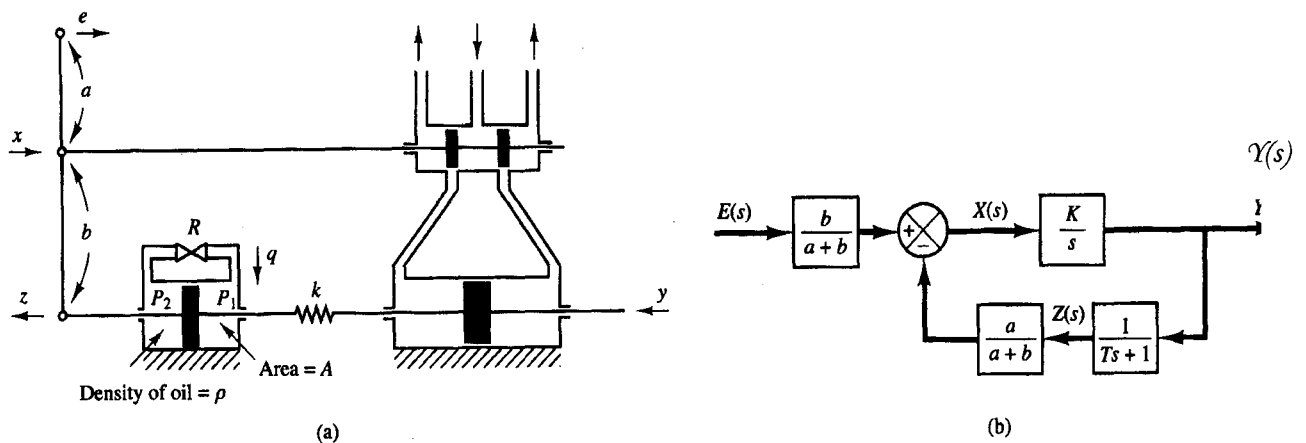


Figure 5-2-2

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