PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester 2 Academic Year: 2007
Date: February 23, 2008 Time: 9:00-12:00
Subject: 226-331: Industrial Automatic Control Room: R300

ทุจริตในการสอบ โทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

Instructions

- There are 7 questions in 4 pages.
- Attempt all questions and write the answers in the answer-book provided.
- A closed-book exam, only a sheet of A4 notes (With your own hand-writing), a dictionary (**not** a talking dictionary) and a calculator without programming capability are allowed.
- Total score is 120.

Name:	Student ID.....

Question #	Full Score	Assigned Score
1	**15**	
2	**15**	
3	**20**	
4	**20**	
5	**20**	
6	**15**	
7	**15**	
Total	**120**	

Assoc. Prof. Somchai Chuchom

Name.....ID..... ..

Question #1 (15 marks) Given the system in Figure 1,

1.1 Specify zeros and poles of the system.

1.2 Solve for the output, c(t).

1.3 From the result of 1.2, identify the forced response part, and the natural response part.

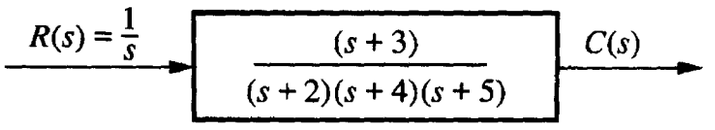


Figure 1

Question #2 (15 marks) For each of the systems shown in Figure 2,

2.1 Find the value of ζ

2.2 Report the kind of response expected (undamped, underdamped, ...) by roughly sketch its response for step input (R(s) = 1/s).

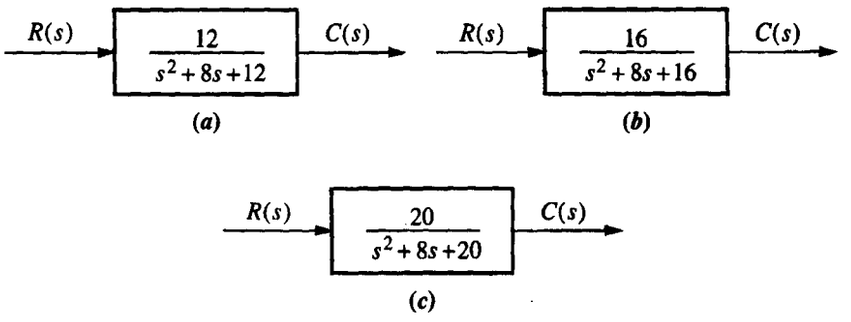


Figure 2

Question #3 (20 marks) Sketch the root loci for the system shown in Figure 3,

3.1 If the locus moves across the $j\omega-$axis, specify K-value for the root on $j\omega-$axis.

3.2 If any break-in or break-away points on the real-axis, specify the points.

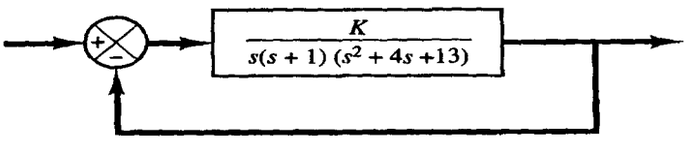


Figure 3

Name.....ID.....

Question #4 (20 marks)

4.1 Determine the range of K for stability of a unity feedback control system whose open-loop transfer function is $G = \dfrac{K}{s(s+1)(s+2)}$

4.2 Apply Linard-Chipart Technique to analyze for the range of K that makes the system in Figure 4 stable.

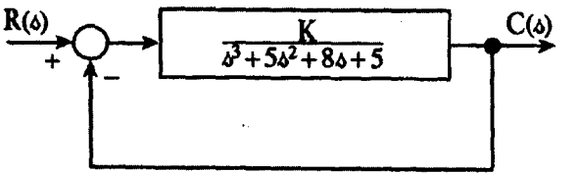
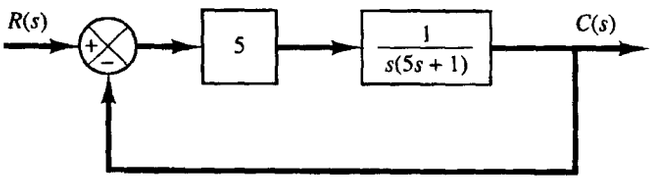
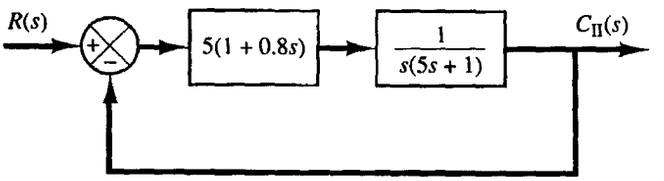


Figure 4

Question #5 (20 marks) The control systems are shown in Figure 5. System I is a positional servo system. System II is a positional servo system with PD control action. Compare the unit-step and unit ramp response of the two systems. Which system is better with respect to the speed of response in the step response.



System I



System II

Figure 5

Question #6 (15 marks)

6.1 Specify the basic components in the pneumatic control system, then show how to connect or link them to form a part in the control system.

6.2 Show the advantages of the hydraulic control system over the pneumatic control system, and mention at least 3 most appropriate applications of it (the hydraulic control system) in the industry.

Question #7 (15 marks) Explain how can you apply the MATLAB software in the automatic control problems by summarizing your work assignment in applying MATLAB in the automatic control system.