PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Midterm Examination: Semester 2 Academic Year: 2006
Date: December 16, 2006 Time: 9:00-12:00
Subject: 226-331: Industrial Automatic Control Room: R200

ทุจริตในการสอบ โทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

Instructions

- There are 5 questions in 8 pages.
- Attempt all questions and write the answer in this exam paper.
- A dictionary (not a talking dictionary) and a calculator without programming capability are allowed.
- Total score is 85.

Name:	Student ID.....

Question #	Full Score	Assigned Score
1	**20**	
2	**20**	
3	**15**	
4	**20**	
5	**10**	
Total	**85**	

Assoc. Prof. Somchai Chuchom

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

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

1.1 A servomechanism is .....

.....

.....

1.2 The manipulated variable (m) is .....

.....

.....

1.3 The three major objectives of the control systems analysis and design are:

1).....

2).....

3).....

.....

1.4 Name three reasons for using feedback control systems, and at least two reasons for not using them.

Reason for using	Reason for not using
1	1
2	2
3	3

1.5 Give at least 3 names for G-type parameters and 3 names for Through variables of the dynamics system

G-type parameters	Through variables
1	1
2	2
3	3

Question #2 (20 marks)

Solve the following differential equations using classical methods.

2a) $\frac{d^2x}{dt^2}+8\frac{dx}{dt}+15x=7u(t)$; Assume zero initial condition

2b) $\frac{d^2x}{dt^2} + 4x = t^2$;Given $x(0) = 1$; $\frac{dx(0)}{dt} = 2$

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

Question #3 (15 marks)

Find the transfer function, $G(s) = X_2(s)/F(s)$, for the translational mechanical network shown in Figure 3.

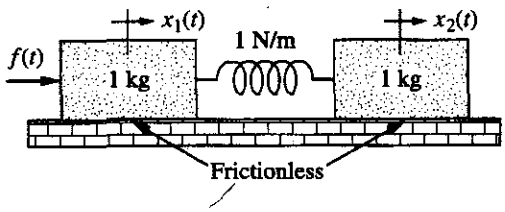


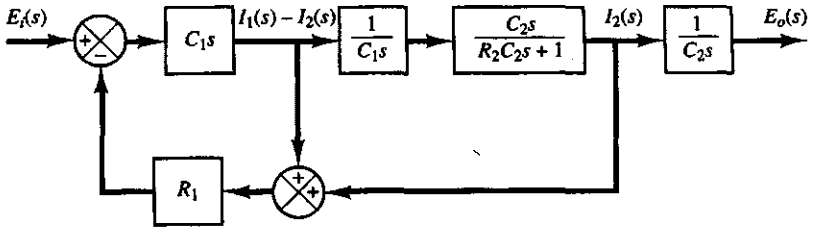
Figure 3

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

Question #4 (20 marks)

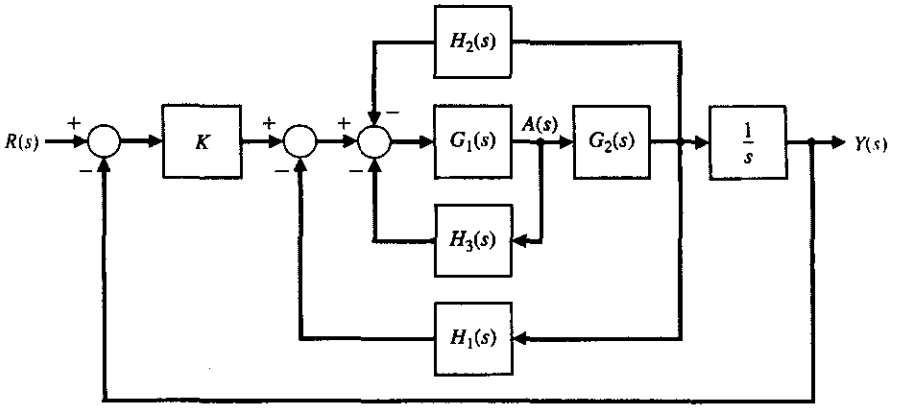
Find the transfer function of the following systems

4a) $E_o(s)/E_i(s)$



(a)

4b) Y(s)/R(s)



Question #4 (10 marks).

In a nuclear power generating plant, heat from the reactor is used to generate steam for the turbines. The rate of the fission reaction determines the amount of heat generated, and this rate is controlled by rods inserted into the radioactive core. The rods regulate the flow of neutrons. If the rods are lowered into the core, the rate of fission will diminish; if the rods are raised, the fission rate will increase. By automatically controlling the position of the rods, the amount of heat generated by the reactor can be regulated. Draw a functional block diagram for the nuclear reactor control system shown in Figure 5. Show all blocks and signals.

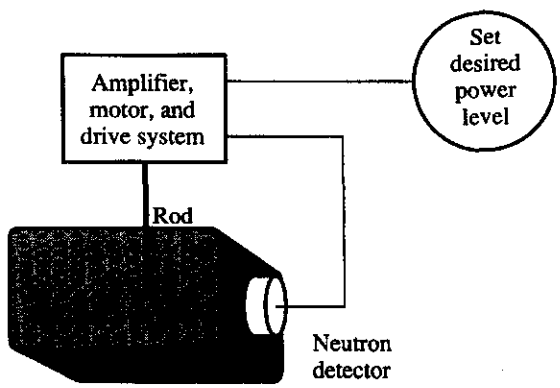


Figure 5. Control of a nuclear reactor