

## King Abdulaziz University Engineering College Department of Production and Mechanical System Design



MENG 366 Automatic Control

Second Exam Closed-book Exam Wednesday: 23/3/1425 H Time Allowed: 90 mins

Name: Sec. No.: ID No.:	
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Question 1	5
Question 2	5
Question 3	5
TOTAL	15

## Instructions

- 2. There are totally 3 problems in this exam.
- 3. Show all work for partial credit.
- 4. Assemble your work for each problem in logical order.
- 5. Justify your conclusion. I cannot read minds.

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- Q1. Consider the feedback control system in Figure 1,
  - a) Show that the uncontrolled system is unstable.



Figure 1

where 
$$G(s) = \frac{1}{3s^3 + 2s^2 + 4s + 7}$$
, and  $C(s) = \frac{k_p s + k_i}{s}$ 

b) Using Routh's array find a range of constants  $k_p$  and  $k_i$  which stabilize the closed loop system. If this is not possible state why. If possible find the steady state error, e(t) = u(t) - y(t) to step input.

Q2. Plot the root locus of the system in Figure 2 and find the range of *K* for stability.



Figure 2

Q3. The block diagram of the system is shown in Figure 3. Use Bode plot to obtain the phase and gain margins of the system when K=10 and when K=100.



Figure 3

أتمنى لك من أعماق القلب أداء ر ائعا فأنت أهلا لذلك

د. سعيد بن أحمد عسيري

