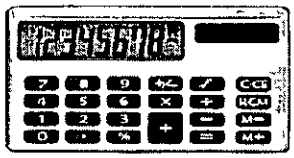
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

CSY3601

October/November 2018

Control Systems III (Theory)

Duration 3 Hours

100 Marks

EXAMINERS

FIRST	PROF Z WANG
SECOND	DR X YE
EXTERNAL	DR L ZHANG

Programmable pocket calculator is permissible

Partial/limited open book examination Specified material as indicated on examination paper, permissible

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This examination question paper consists of 3 pages including this "cover" page

Partial Open book exam Ogata, K Modern Control Engineering
Or Norman S Nise Control System Engineering

Answer all the questions

PLEASE NOTE. IF YOU HAVE THE OPINION THAT INSUFFICIENT INFORMATION IS SUPPLIED FOR YOU TO ANSWER A PARTICULAR QUESTION, MAKE A REALISTIC ASSUMPTION, MOTIVATE IT AND THEN ANSWER THE QUESTION.

QUESTION 1

The circuit shown in Figure 1

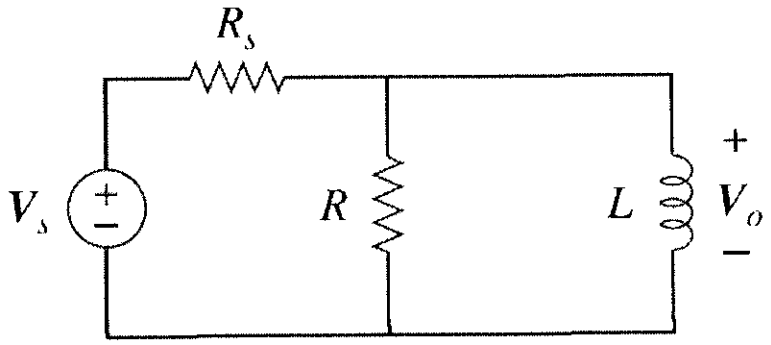


Figure 1 Circuit for Question 1

In Figure 1, L = 4 H, R_s = 5 Ω and R = 5 Ω

Find the transfer function $H(s)=\frac{V_o(s)}{V_s(s)}$ of this system

[12]

QUESTION 2

The control system is shown in Figure 2 Find the transfer function C(s)/R(s) using Mason's gain formula

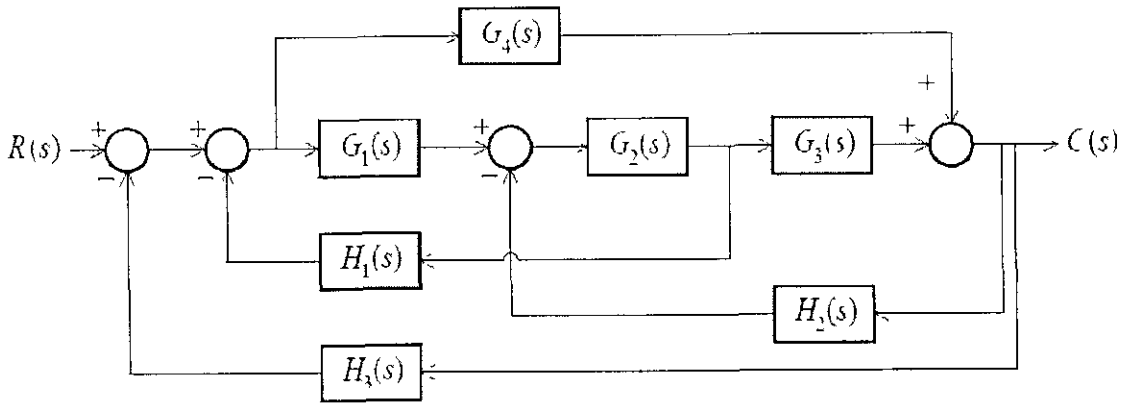


Figure 2 Control system for Question 2

[20]

QUESTION 3

The system shown in Figure 3 has $\%os = 23\ 3\%$, find the value of K and calculate the settling time T_s (2% criteria)

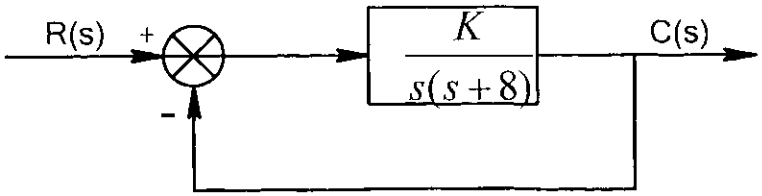


Figure 3 Control system for Question 3

[13]

QUESTION 4

A unity negative feedback system is shown in Figure 4

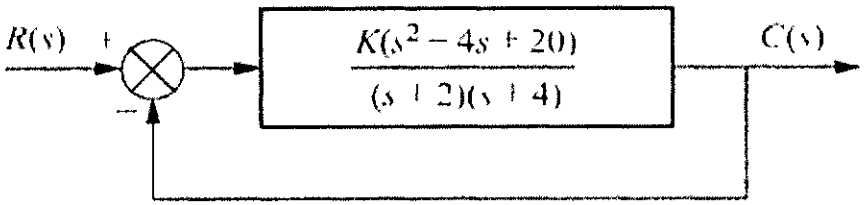


Figure 3

Sketch the root locus of this system

[20]

QUESTION 5

For the unity negative feedback system with open loop transfer function

$$G(s) = \frac{10}{2s^4 + s^3 + 3s^2 + 2s + 5}$$

Check whether the closed-loop system is stable or not based on Routh's stability criterion

[15]

QUESTION 6

Sketch the Bode plots (straight line approximations) for

$$G(s) = \frac{s+1}{s^2(s+10)}$$

[20]

TOTAL: 100

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