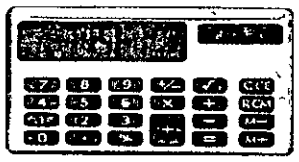
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

CSY3601

October/November 2017

CONTROL SYSTEMS III (THEORY)

Duration 3 Hours

100 Marks

EXAMINERS

FIRST	PROF Z WANG
SECOND	DR X YE
EXTERNAL	PROF AA YUSUFF

Programmable pocket calculator is permissible

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

This examination question paper consists of 4 pages including this "cover" page

Partial Open book exam Ogata, K Modern Control 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

Consider the circuit shown in Figure 1

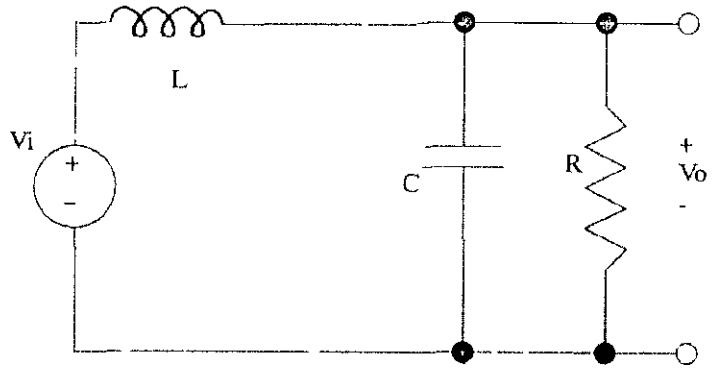


Figure 1 Circuit for Question 1

Here, L = 2 H, C = 2 5 F and R = 10 Ω

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

[16]

QUESTION 2

Consider the control system shown in Figure 2 Please find the transfer function using Mason's gain formula or block-diagram-reduction techniques

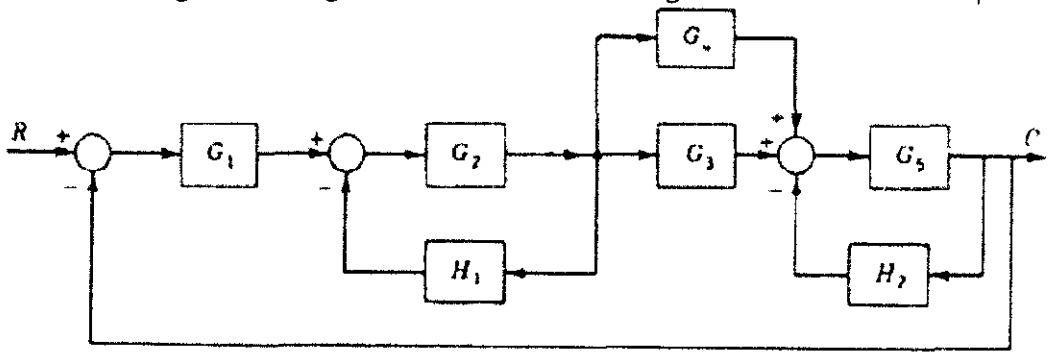


Figure 2 Control system for Question 2

[21]

[TURN OVER

QUESTION 3

The system shown in Figure 3 has $\%os = 15\%$ and $T_p = 1.5s$, find the values of K, K_A

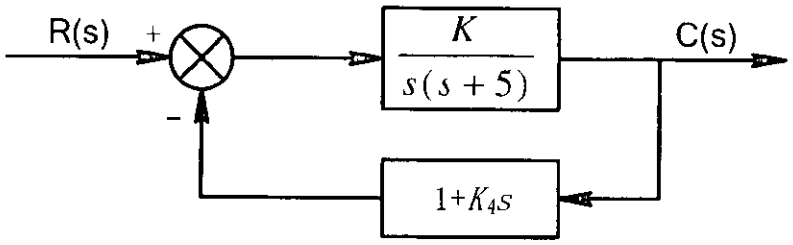


Figure 3 Control system for Question 3

[20]

QUESTION 4

Consider the unity negative feedback system shown in Figure 4

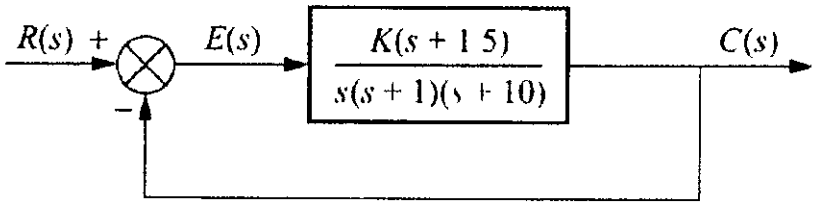


Figure 4: Control System for Question 4

Sketch the root locus of this system

[20]

QUESTION 5

For the unity negative feedback system with open loop transfer function

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

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

[15]

[TURN OVER]

QUESTION 6

The open loop transfer function of a unity feedback system is given by

$$G(s)=\frac{100(1+s/10)}{s(1+s/100)^2}$$

Sketch the Bode magnitude (straight line approximations) of the system.

[8]

TOTAL: 100