



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

CONTROL SYSTEMS 1

DATE: 26/3/2021

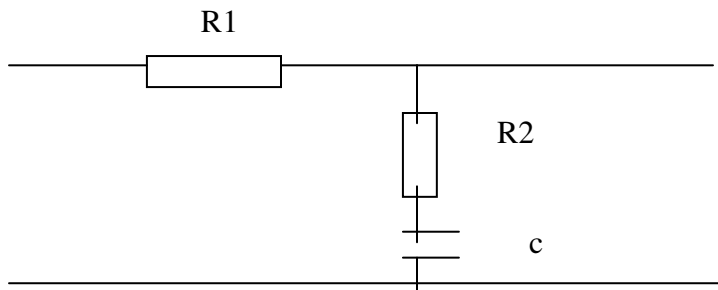
TIME: 11.00-1.00 PM

INSTRUCTIONS

Answer Question One and any Other Two Questions

QUESTION ONE (30 MARKS)

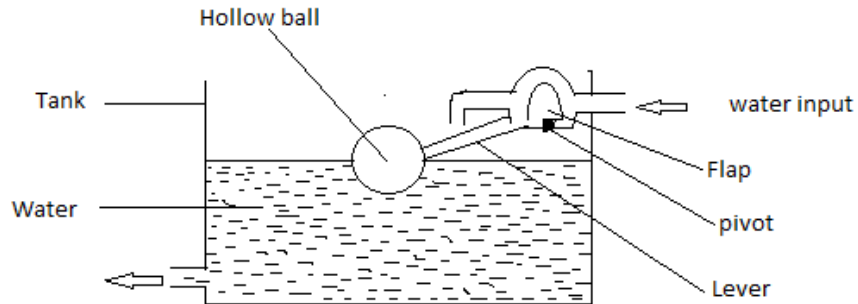
- a) Figure below shows a phase lag compensator. Derive its transfer system. (10 marks)



- b) name three types of input signals. (6 marks)
- c) with an aid of a canonical block diagram of a closed loop system derive
- closed loop transfer function
 - error ratio
 - primary feed back ratio. (9 marks)
- d) define the following terms
- a system
 - a control system (2 marks)
- e) State any three advantages of a feedback in a control system. (3 marks)

QUESTION TWO (20 MARKS)

Fig below shows a control system used to maintain constant water level in the tank.

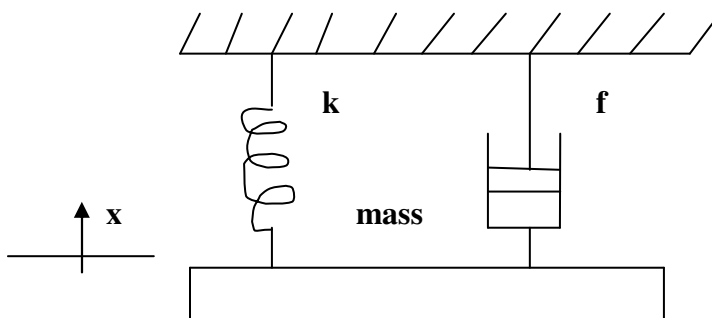


Identify the following

- controlled variable
- error signal
- correction element
- measuring device
- state whether the system is open or closed loop

QUESTION THREE (20 MARKS)

- A mechanical system consisting of a mass M attached to a spring (of stiffness K) and a dash pot (viscous friction coefficient f) on which a force F operates as shown below.



derive the transfer function.

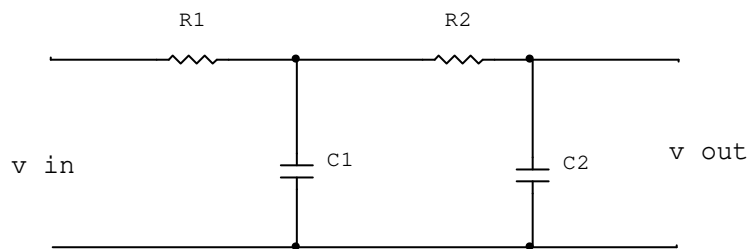
(5 marks)

- b) i) list any four advantages of open loop over closed loop systems
ii) state with reason whether the control systems used in each of the following systems is closed or open loop
-furnace temperature controller
-washing machine

(15 marks)

QUESTION FOUR (20 MARKS)

determine the transfer function of the network shown below



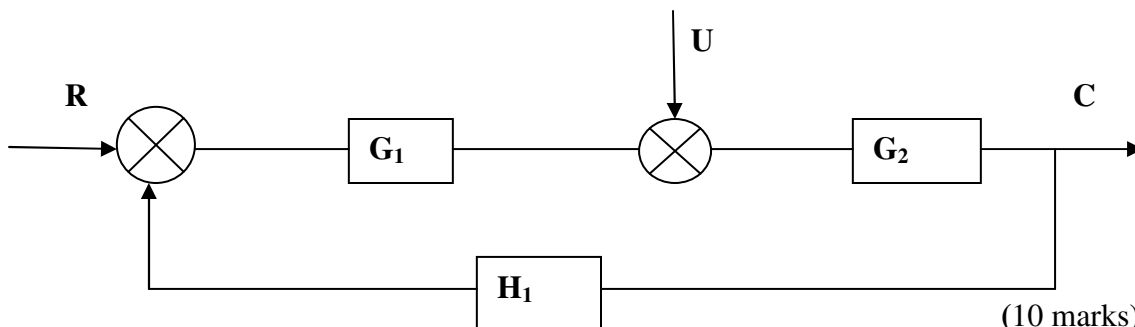
QUESTION FIVE (20 MARKS)

a) with an aid of a diagram , explain

- i. overshoot
- ii. rise time
- iii. settling time
- iv. delay time
- v. peak time

(10 marks)

b) for the multi input system below, obtain the transfer function



(10 marks)