



MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING MODULE 2

CONTROL SYSTEMS 1

DATE: 7/9/2021

TIME: 8:30 – 11:30 AM

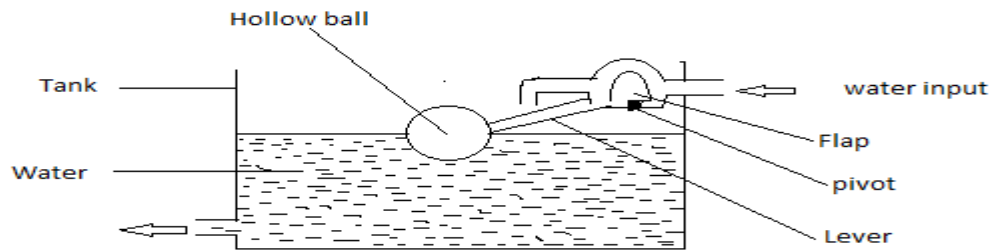
INSTRUCTIONS: ANSWER ALL QUESTIONS

Question one

- (a) With an aid of a canonical block diagram of a closed loop system derive the following formulas
- (i) closed loop transfer function
 - (ii) error ratio
 - (iii) primary feedback ratio. (15 marks)
- (b) Define the following terms
- (i) a system
 - (ii) a control system (2 marks)
- (c) State any three advantages of a feedback in a control system. (3 marks)

QUESTION TWO

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



Identify the following

i) controlled variable

ii) error signal

iii) correction element

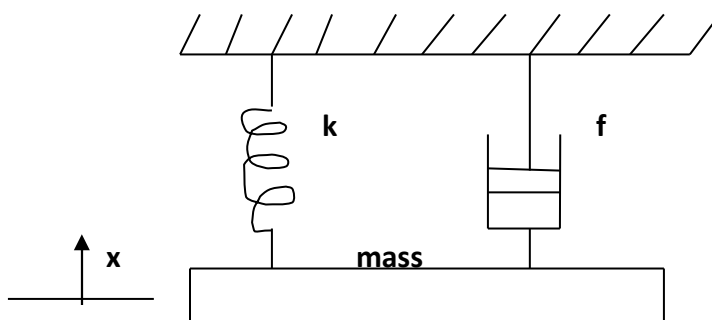
iv) measuring device

v) state whether the system is open or closed loop

(20 marks)

QUESTION THREE

- (a) 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.

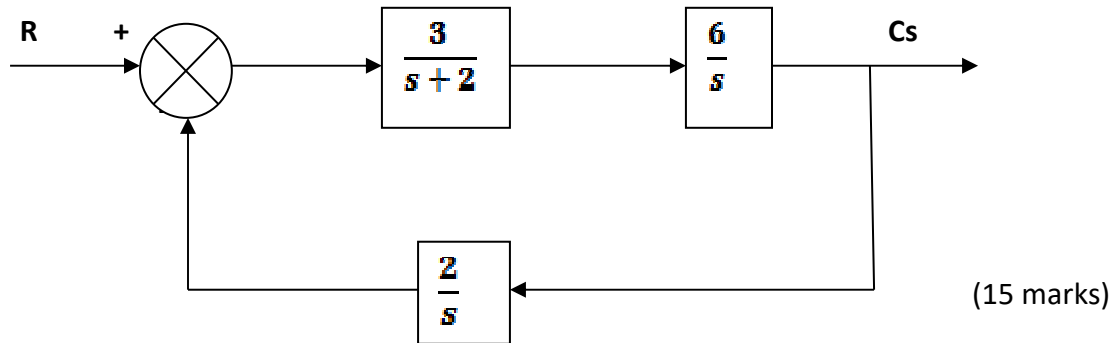


derive the transfer function.

(5 marks)

(b) for the system shown below, determine

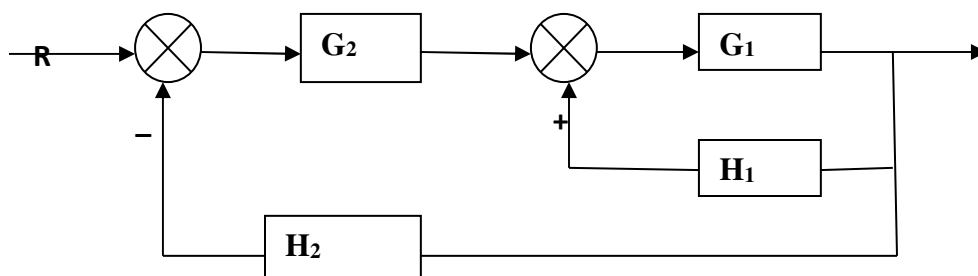
- i) open loop transfer function
- ii) closed loop transfer function
- iii) error ratio
- iv) feed back transfer function.



QUESTION FOUR

Using the block diagram algebra, reduce the block diagram of figure below to its canonical form and hence determine

- i) forward transfer function
- ii) feed back transfer function
- iii) error ratio
- iv) primary feedback ratio
- v) open loop transfer function



(20 marks)

QUESTION FIVE

(a) with an aid of a diagram , explain

(i) overshoot

ii) rise time

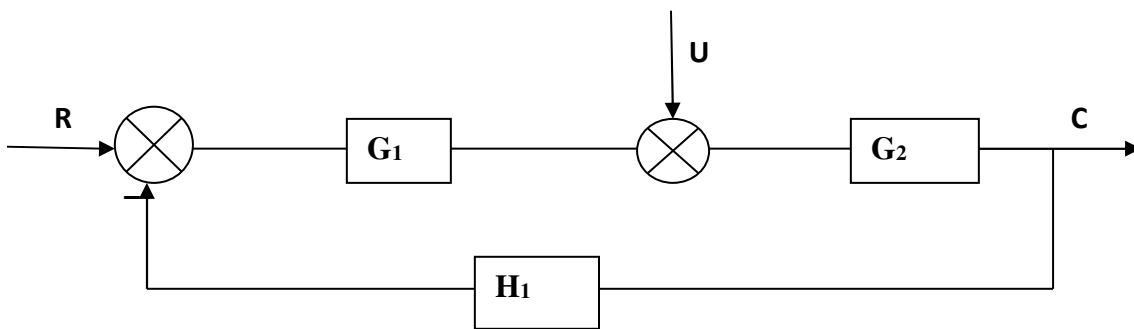
iii) settling time

iv) delay time

v) peak time

(10 marks)

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



(10 marks)