MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SPECIAL/SUPPLIMENTARY EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

CONTROL SYSTEMS 1

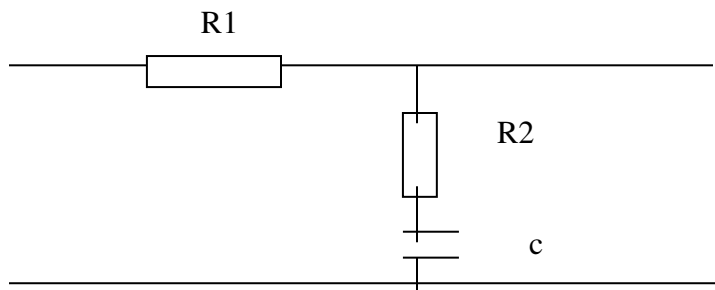**DATE: 26/3/2021**   **TIME: 11.00-1.00 PM**

INSTRUCTIONS

    Answer Question One and any Other Two Questions

QUESTION ONE (30 MARKS)

a)   Figure below shows a phase lag compesitor. 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

    i.   closed loop tranfer function

    ii.   error ratio

    iii.   primary feed back ratio.   (9 marks)

d)   define the following terms

    i.   a system

    ii.   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.
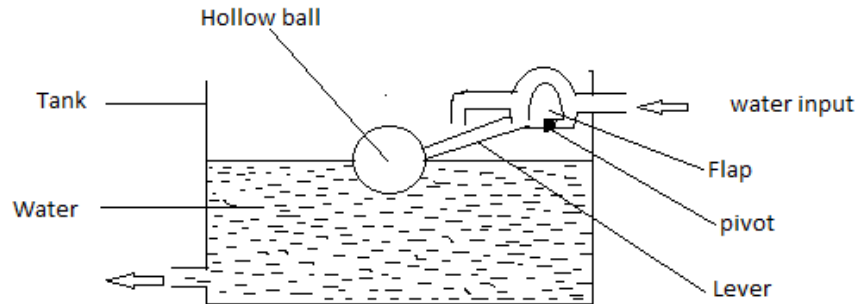
Identify the following

a)   controlled variable

b)   error signal

c)   correction element

d)   measuring device

e)   state wheather the system is open or closed loop

QUESTION THREE (20 MARKS)

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

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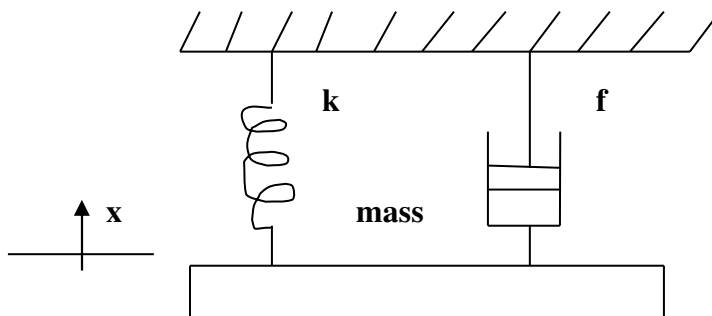
derive the transfer function.   (5 marks)
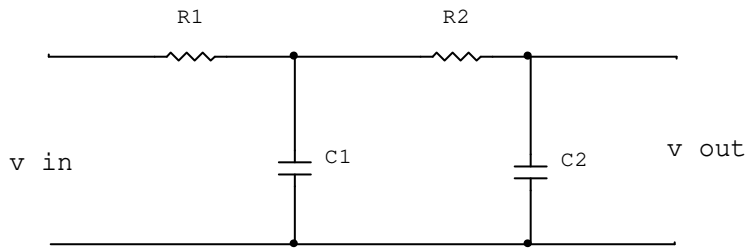
b)   i)   list any four advantages of open loop over closed loop systems

      ii   state with reason wheather the control systems used in each of the following systems

              is closed or open loop

              -furnace temperature contoller

              -washing machine   (15 marks)

QUESTION FOUR (20 MARKS)
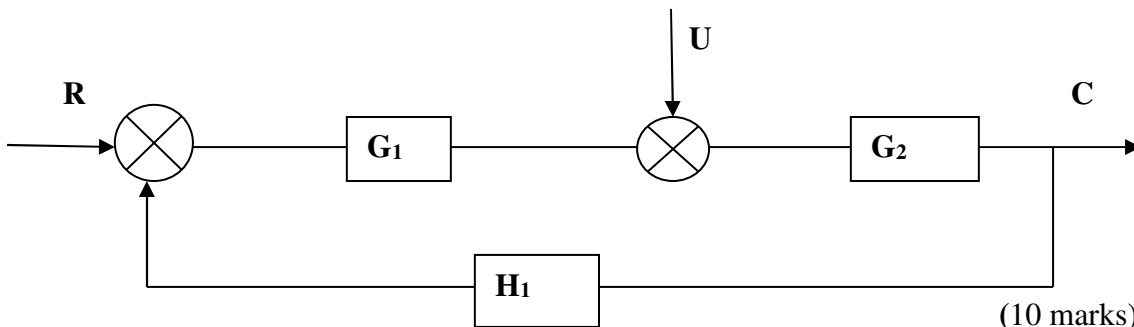
determine the transfer function of the network shown below

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)