SASTRA DEEMED UNIVERSITY

(A University under section 3 of the UGC Act, 1956)

End Semester Examinations

May 2025

Course Code: **EIE329M**

Course: **CONTROL AUTOMATION**

QP No. :**U016-M**

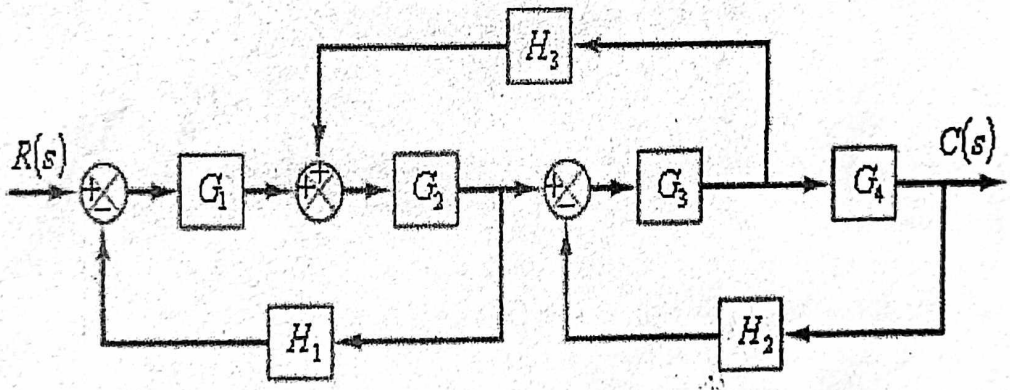
Duration: **3** hours

Max. Marks:**100**

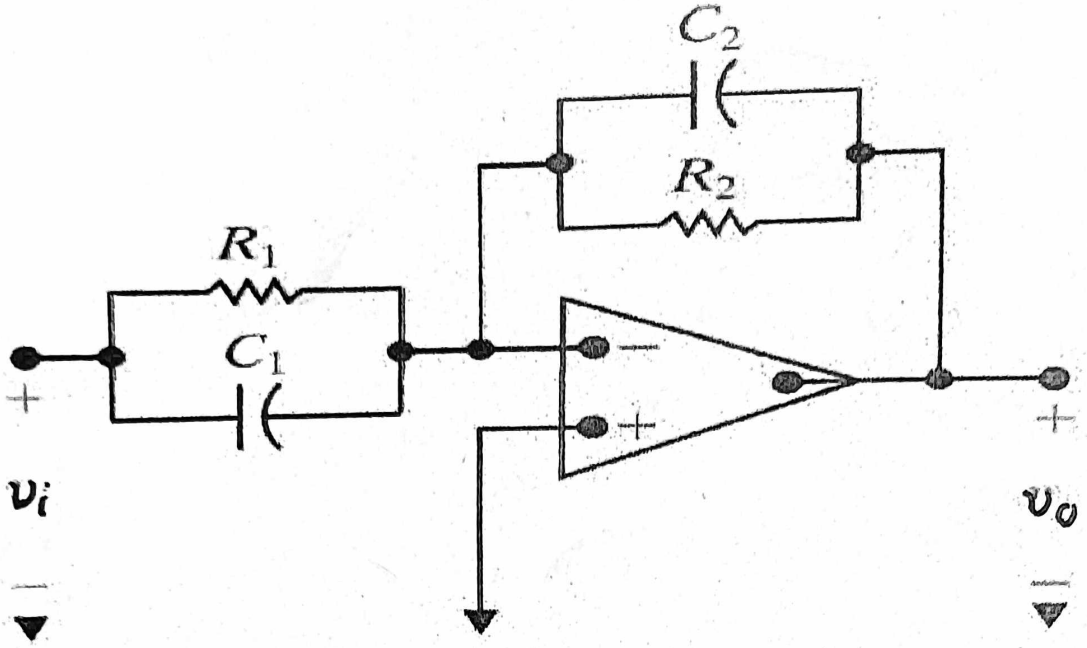
PART – A

Answer any FOUR questions **4 x 20 = 80 Marks**

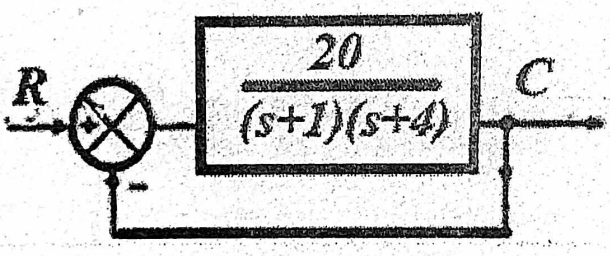
1. (a) Find the transfer functions C(s)/R(s) for the given block diagram. (15)



(b) Derive the transfer function V0(s) / Vi(s) for the lag-lead network given below.



2. (a) For the system shown below, obtain the closed loop transfer function and the damping ratio, natural frequency. Also obtain the output response if the system is subjected to a unit step input. (12)



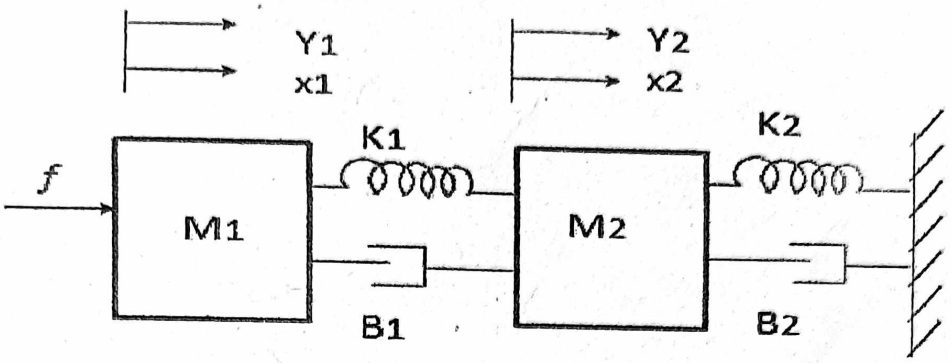
(b) In the above system, consider feedback element H(s) = (s+3) and find the Routh stability. (8)

3. The open loop transfer function of a control system is given as

$$G(s)\,H(s) = \frac{K}{s(s+1)(s+10)}$$

Draw the root locus and find the stability limit of K.

4. Obtain the SS model for the mechanical system shown.



5. (a) Find the state feedback gain matrix if the desired closed loop poles are located at -5, -5. Find by direct method.

$$\begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ -2 & -3 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \end{pmatrix} u$$

(b) Design the full order state observer. The desired closed loops are located at -5, -5 where $A = \begin{pmatrix} -1 & 1 \\ 1 & -2 \end{pmatrix}$ ***and*** $C = \begin{pmatrix} 1 & 0 \end{pmatrix}$

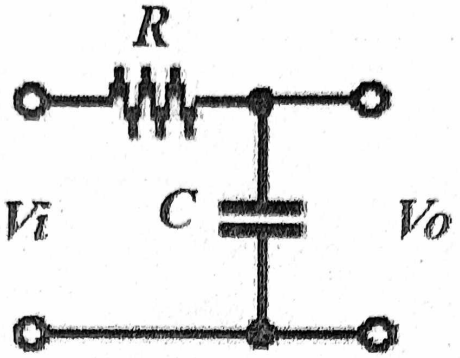
6. (a) In a factory with 4 machines; every machine has its own start and stop push button switches. With the concept of interlocking develop ladder diagram such that only one machine can at a time. (10)

(b) In the above problem, modify the logic such that any three or two or one can run at a time for which show the respective developed ladder logic diagram. (10)

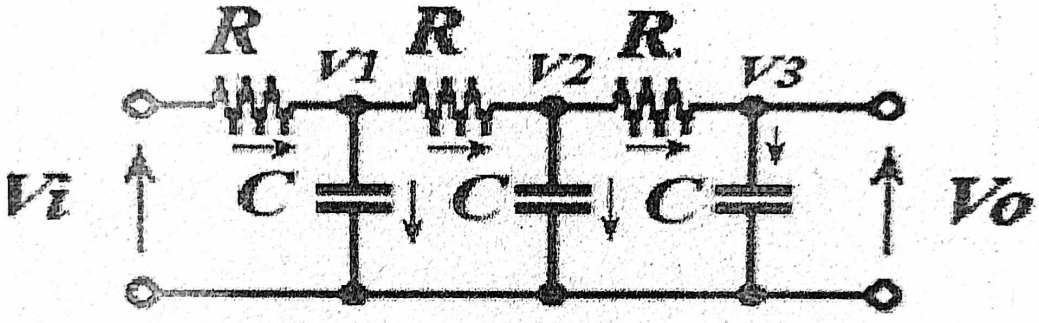
PART – B

Answer the following **1 x 20 = 20 Marks**

7. (a) Obtain the transfer function model for the RC network given. (4)



(b) Obtain the state space model for the given system. (12)



(c) Find the Routh stability criteria if the characteristics equation is

$$5s^6 + 8s^5 + 12s^4 + 20s^3 + 100s^2 + 150s + 100 = 0 \qquad (4)$$

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