SASTRA

School of Electrical & Electronics Engineering
CIA-I Exam –MARCH 2025
Course: Control & Automation Max Marks: 50
Course Code: EIE329   Duration: 90 minutes
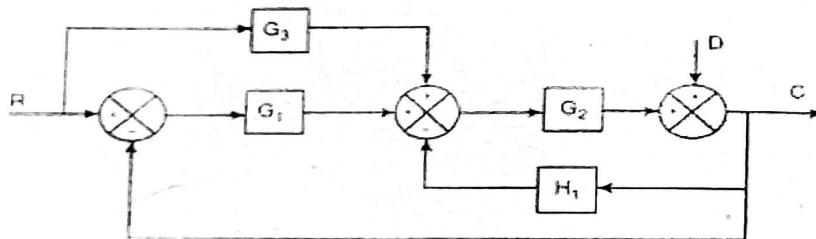DATE OF EXAM: 13.3.2025 (9.00 AM– 10.30 AM)

PART – A

Answer any 5 of the following questions: (5 × 10 =50 Marks)

1. Reduce the given block diagram using BDR technique.

2. Determine the stability using Routh Stability criteria, when the OLTF of a UFB system

$$G(s) = \frac{10}{(s^5 + 2s^4 + 3s^3 + 6s^2 + 5s + 3)}$$

How many number of roots lie in the RH of s-plane.
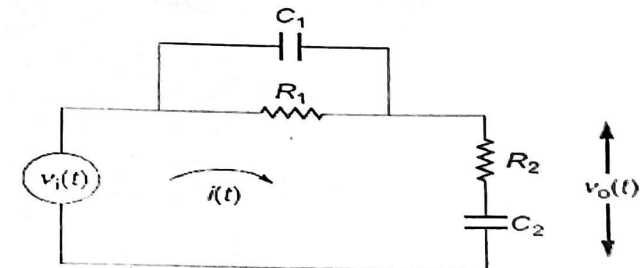
3. Plot the root locus for the OLTF

$$G(s)H(s) = \frac{K}{(s+1)(s+4)(s+20)}$$

Determine the stability limit of K

4.
(a) Given $\dfrac{C(s)}{R(s)} = \dfrac{10s + 10}{(s^2 + 10s + 10)}$

For a step input of magnitude 6, obtain the transient response. (5marks)

b) Develop the TF Model the system given below (5 Marks)

5. In a simple feedback control system in which

$$G(s) = \frac{20}{(s+1)(s^2 + 10s + 6)} \quad \& \quad H(s) = \frac{5}{(s+3)}$$

Determine the steady state error, for the system input (i) step input of magnitude 5 (ii) ramp input of magnitude 4

6. Sketch the bode plot

$$G(s) = 2 / [s (1+0.0625 s) (1+ 0.5s)]$$

Find the gain and phase cross over frequency, comment on the GM and PM obtained.

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School of Electrical & Electronics Engineering
CIA-2 Exam –APRIL 2025
Course: Control & Automation   Max Marks: 50
Course Code: EIE329   Duration: 90 minutes
DATE OF EXAM: 24.4.2025   (9.00 AM– 10.30 AM)

PART – A
Answer any 4 of the following questions: (4 × 10 =40 Marks)

1. Derive the state space model for the mechanical system given below.
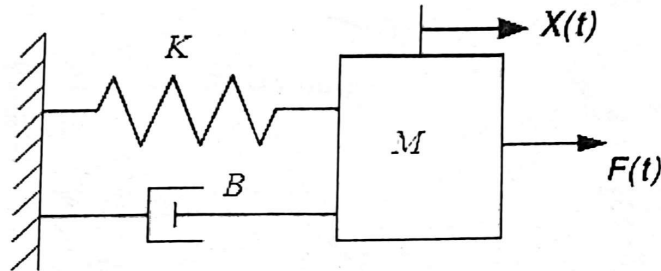
2. For the system given below, check the Controllability & Observability

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ -1 & 0 & -2 \end{pmatrix} \quad B = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \quad \& \quad C = \begin{pmatrix} 1 & 1 & 0 \end{pmatrix}$$

3. Design state feedback controller for the system given below if the desired closed loop poles are located at -5, -5. Also carry out state observer design.

$$A = \begin{bmatrix} 0 & 1 \\ -12 & -7 \end{bmatrix}; \quad B = \begin{pmatrix} 0 \\ 1 \end{pmatrix}; \quad C = \begin{pmatrix} 0 & 1 \end{pmatrix}$$

4. (a) A 4 cornered room has 4 START & 4 STOP switches located in each corner of the room. Any of the START switches can turn ON the bulb in the room and any of the stop switches can turn OFF the bulb. Develop ladder illustration. Explain.
(b) A motor circuit is operated with a start and stop push-button switches. Use seal-in concept in that and illustrate the same in ladder diagram. Brief.

5. Sketch out the DCS architecture neatly and list out its various components, brief on LCU and its significance.

PART – B
Answer the following question: (1 × 10 = 10 Marks)

6. (a) Consider a RL series circuit, obtain the TF model

(b) Also obtain the SS model for the same circuit.

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