R22 Regulation *Subject code:* **4E4BD**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, December 2024

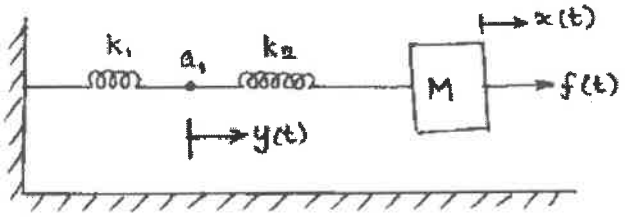
CONTROL SYSTEMS

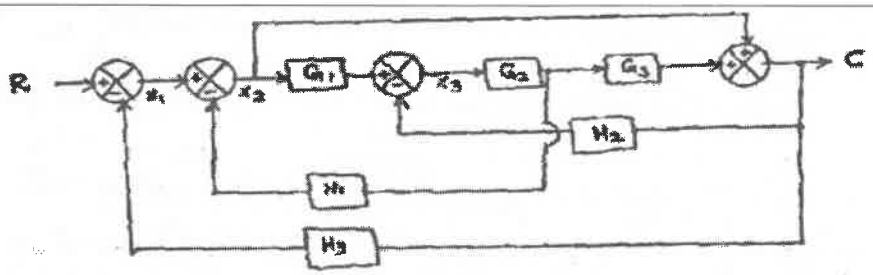
(EEE)

Maximum Marks: 60 Date:10.12.2024 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

	Part-A	CO	Bloom Tx
All the following questions carry equal marks	(10X1M=10 Marks)		
1.a)	What are the effects of Feedback?	1	2
b)	Define Mason's gain formula?	1	1
c)	State final value theorem?	2	2
d)	Draw the time response of second order system for unit step input?	2	3
e)	Explain about Routh Stability criterion?	3	4
f)	Define Phase margin and Gain margin?	3	1
g)	Compare between absolute stability, conditional stability and relative stability.	4	5
h)	State and explain Nyquist Criteria.	4	6
i)	What are the advantages of State variable model of dynamic system?	5	3
j)	How do you determine the system eigen values and what is its role in the system response?	5	2

	Part-B		
Answer All the following questions.	(5X10M=50Marks)		Bloom Tx level
2	Consider the mechanical system shown below. Identify the variables and write the differential equations. [10M] 	1	3
	OR		
3	A block diagram is shown below. Construct the equivalent signal flow graph and obtain C/R using Mason's formula. [10M]	1	4

		1	3
4	The open loop transfer function of an unity feedback control system is given as G(s) = $\frac{K}{1+sT}$. Determine the factor by which the gain 'K' should be multiplied so that the overshoot of the unity step response be reduced from 80% to 25%? [10M]	2	2
	OR		
5	What is meant by steady state respone and explain all time domain specifications? [10M]	2	5
6	Sketch the root locus of the unity feedback system having G (s) = $\frac{K}{s^2+2s+2}$ for positive values of K. Sketch the new root locus when a simple pole at s = −5 is added to the system loop transfer function. Hence indicate the effect of adding this pole on the root locus of the system. [10M]	3 3	2 3
	OR		
7	Using R-H criteria find the stability of system. [10M] $G(S) = \frac{K}{S^4+3S^2+2S^2+S+4}$	3	4
8	What is a Lag compensator? Realize the lag compensator with the help of basic electrical components and thus draw its frequency response. [10M]	4	2
	OR		
9	a) Draw the polar plot for G(s)H(s) = $\frac{1+2s}{1+3s}$. [5M] b) The forward path transfer function of a unity feedback control system is G(s)= 6/(s^2(s+3)) . Draw the Bode plot. [5M]	4 4	2 4
10	a) Distinguish between Transfer function model and State Space model. [5M] b) Explain the concept of Controllability and Observability. [5M]	5 5	3 5
	OR		
11	a) Obtain the solution for time invariant state equation for step input. [5M] b) Obtain the normal form of state model for the system whose transfer function is given by [5M] T(s) = $\frac{Y(s)}{U(s)} = \frac{(s+1)}{S(s+2)(s+4)}$	5 5	1 4