R22 Regulation *Subject code: 4E4BD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

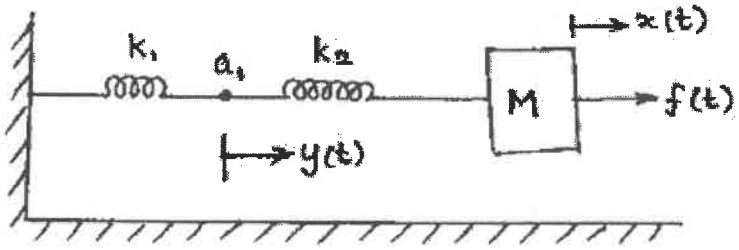
B.Tech IV Semester Regular Examinations, July 2024

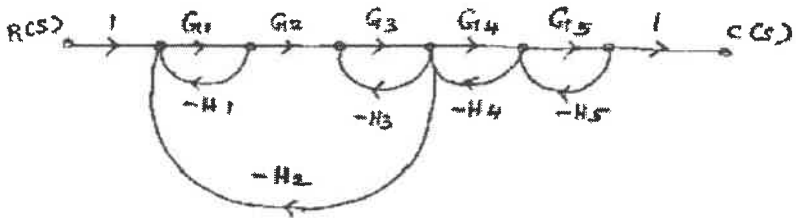
CONTROL SYSTEMS

(EEE)

Maximum Marks: 60 Date:25.07.2024 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)	Differentiate between open loop and closed loop control systems.	1	2
b)	Why do you need a feedback controller? Justify your answer with an example.	1	3
c)	Find the peak overshoot for unit step response of the system described by closed loop transfer function, $G(s) = \frac{64}{s^2+16s+64}$	2	4
d)	List out the standard input signals?	2	1
e)	How do you find breakeven point in root locus?	3	2
f)	Define RH criterion of stability?	3	2
g)	Write equation for Proportional Integral controller?	4	5
h)	What is the relationship between time response and frequency responses?	4	6
i)	What are the advantages of state variable analysis?	5	1
j)	What is the significance of eigen values in stability analysis?	5	2
	Part-B		
Answer All the following questions. (5X10M=50Marks)			
2	Consider the mechanical system shown below. Identify the variables and write the differential equations. [10M] 	1	4
	OR		

3	For the signal flow graph shown below, find C(S)/R(S) by using Mason's gain formula. [10M] 	1	4
4	Determine the time response specifications of standard second order system. [10M]	2	5
	OR		
5	Determine the error coefficients and static error for $G(s)H(s) = \frac{s+2}{s(S+1)(S+10)}$ [10M]	2	6
6	The forward path transfer function for a unity feedback system is given by G(s)= $\frac{K(s+1)}{s(s+2)(s^2+s+3)}$. Draw the root locus for K ≥ 0. [10M]	3	4
	OR		
7	Using Routh stability criterion, determine the stability of the unity feedback control system with the following open loop transfer function. $\frac{C(s)}{R(s)} = \frac{9}{s(s+1(s+6)}$. . [10M]	3	3
8	a) Draw the bode plot for the forward path transfer function of a unity feedback control system which is given below $G(s) = \frac{1}{s(s+2)}$ [5M] b) Explain in detail about lead compensation in design. [5M]	4 4	2 1
	OR		
9	a) The forward path transfer function of a unity feedback control system is $G(s) = \frac{6}{(s+3)s^2}$). Sketch the Nyquist Plot. [5M] b) Illustrate about integral and derivative controllers with neat sketch. [5M]	4 4	3 1
10	a) Explain in detail about diagonalization of state matrix. [5M] b) Obtain the state space representation of the following differential equation $d^3y/dt^3 + 2d^2y/dt^2 + 3\,dy/dt + y = u$, where y is the output and u is the input. [5M]	5 5	2 3
	OR		
11	a) Explain properties and significance of state transition matrix. Obtain the state transition matrix of A = [1 0; 1 1] [5M] b) With an example, explain the concept of observability and controllability. [5M]	5 5	2 1