R18 Regulation *Subject code:2O7BA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VII Semester Supplementary Examinations, December 2024

ADVANCED CONTROL SYSTEMS

(EEE)

Maximum Marks: 70 Date:04.01.2025 Duration: 3 hours

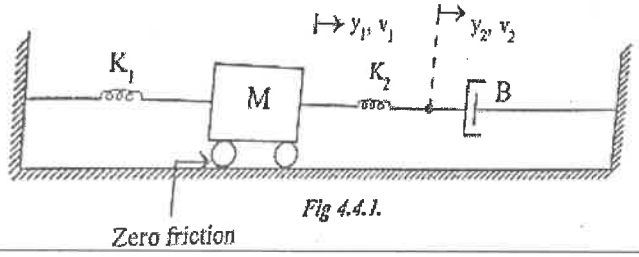
Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

	All the following questions carry equal marks (10X2M=20) Marks)	CO	Bloom Tx
1	Define Polar Plot.	1	L1
2	Define Nyquist plot	1	L1
3	Define Linear Autonomous Systems	2	L1
4	Define asymptotic stability?	2	L1
5	What is singular point?	3	L1
6	What is stable in the large?	3	L1
7	What is saturation? Give an example	4	L1
8	Write the describing function of ideal relay	4	L1
9	What are the advantages of state space analysis	5	L1
10	What is state and state variable?	5	L1

Part-B

	Answer All the following questions. (5X10M=50Marks)	CO	Bloom Tx
11	Draw the polar Plotof the open loop transfer function for K=1 and G(S)H(S)=K/S(S+1) (S+4). [10M]	1	L2
	OR		
12	Explain the procedure to design the Lag Compensator using Bode plot. [10M]	1	L2
13	Determine the stability of the system using Lyapunov method [10M] $\dot{x}=Ax$ where A=[-1 -2] [1 -4] Find a suitable lyapunov function	2	L2
	OR		
14	Check the stability of the system described by [10M] $\dot{x}_1 = -x_1 + 2x_1^2x_2$ $\dot{x}_2 = -x_2$ Use variable gradient method	2	L2
15	Describe the isoclines method of drawing phase plane trajectory. [10M]	3	L2
	OR		
16	Construct a phase trajectory by delta method for a nonlinear system	3	L2

	represented by the differential equation $\ddot{x} + 4\lvert\dot{x}\rvert\dot{x} + 4x = 0$ Choose the initial conditions as $x(0) = 1.0$ and $\dot{x}(0) = 0$. [10M]		
17	determine and sketch the describing function for Dead-Zone nonlinearity. [10M]	4	L2
	OR		
18	determine and sketch the describing function for saturation nonlinearity. [10M]	4	L2
19	a)Explain the state variable and state transition matrix. [5M] b) Derive the expression for the calculation of the transfer function from the state variables for the analysis of system? [5M]	5	L2
	OR		
20	Obtain the state model of the mechanical system shown in figure.by choosing a minimum of three state variables. [10M]  *Fig 4.4.1.*	5	L2