Register Number:……………..

KUMARAGURU
college of technology
character is life

B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fourth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U18EII4203: Modelling and Analysis of Dynamic Systems

<u>COURSE OUTCOMES</u>

CO1: Model any given 1st and 2nd order physical system and analyse the dynamic response.

CO2: Apply the block diagram reduction technique, Signal flow Graph, Bond graph and State space modelling for the given physical system.

CO3: Analyse the time response for the given system and the steady state error.

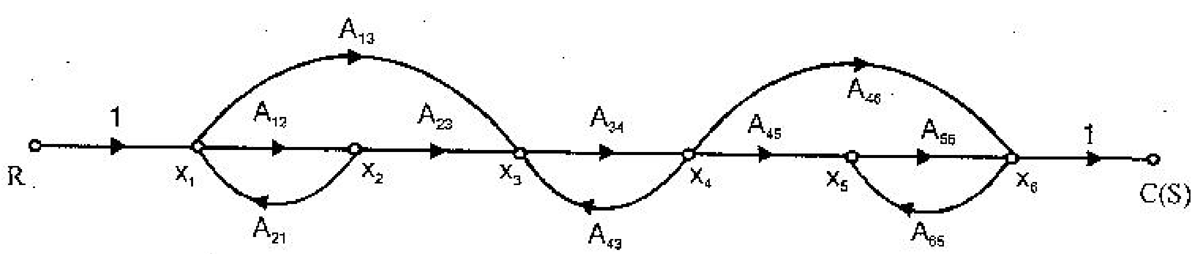
CO4: Analyse the stability of the given system using Bode plot, polar plot and Nyquist plot and also analyse the stability in digital domain.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

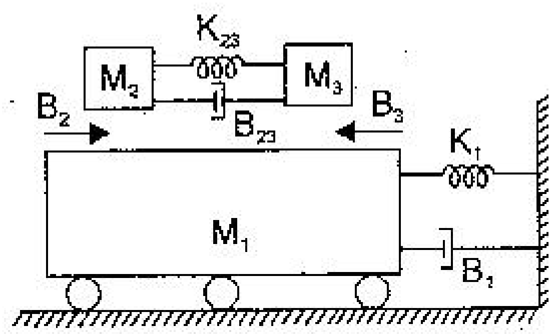
PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

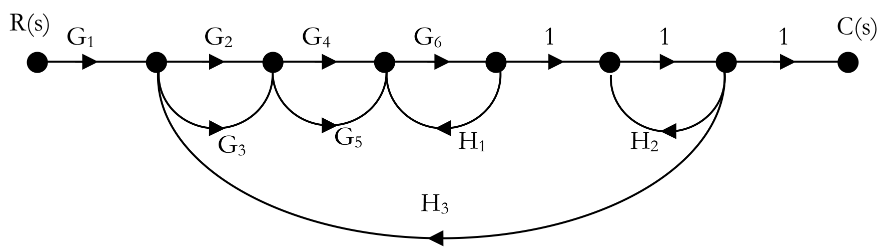
1.	What are the basic components of an automatic control systems?	CO1	[K_2]
2.	 For the given signal flow graph, identify the number of forward path and number of individual loop.	CO1	[K_2]
3.	State is the effect of positive feedback on stability.	CO1	[K_2]
4.	What is the basis for framing the rules of block diagram reduction technique?	CO2	[K_2]
5.	Define path and Non-touching loop.	CO2	[K_1]
6.	A second order system has a damping ratio of 0.6 and natural frequency of oscillation is 10 rad/sec. determine the damped frequency of oscillation.	CO3	[K_2]
7.	Differentiate type and order of the system.	CO3	[K_2]
8.	List are the graphical techniques available for frequency response analysis.	CO4	[K_1]
9.	Sketch the polar plot of $G(S)= 1 / S^2 (1+ ST_1)(1+ ST_2)(1+ ST_3)$.	CO4	[K_2]
10.	What are the regions of root locations for stable, unstable and limitedly stable systems?	CO4	[K_2]

Answer any FIVE Questions: -
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. Write down the differential equation for the given mechanical translational system as shown in fig. and derive its transfer function and also draw the electrical equivalent analogous system | 16 | CO1 | [K_3]



12. Use Mason's gain formula for determining the overall T.F. of the system shown. | 16 | CO2 | [K_3]



13. a) A unity feedback control system has a loop transfer function, $G(s) = 10/s(s+2)$. Find the rise time, percentage overshoot, peak time and settling time for a step input of 12 units. | 8 | CO3 | [K_3]

b) Measurement conduct on a servomechanism show the system response to be $c(t) = 1+0.2\ e^{60t} - 1.2e^{-10t}$ when subject to a unit step input. Obtain an expression for closed loop transfer function. Determine the undamped natural frequency and damping ratio. | 8 | CO3 | [K_3]

14. Plot the bode diagram for the following transfer function and obtain the gain and phase cross over frequencies. | 16 | CO4 | [K_3]

$G(s) = 10 / s(1+0.4s)(1+0.1s)$.

15.		The open loop transfer function of a unity feed back system is given by, $G(s) = (1+0.2s)(1+0.025s) / s^3(1+0.005s)(1+0.01s)$. sketch the polar plot and determine the phase margin.	16	CO4	[K_3]
16.	a)	The characteristic polynomial of a system is $s^7+9s^6+24s^5+24s^4+24s^3+24s^2+23s+15=0$. Determine the location of roots on s-plane and hence the stability of the system.	6	CO4	[K_3]
	b)	The open loop transfer function of a unity feedback system is given by $G(s) = K(s+9) / s(s^2+4s+11)$. Sketch the root locus of the system.	10	CO4	[K_3]

****