Register Number:……..

KUMARAGURU college of technology
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B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Fifth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U18EEI5203: Control Systems

COURSE OUTCOMES

CO1: Derive the transfer functions model of electromechanical systems.

CO2: Analyse the system response in time and frequency domains.

CO3: Analyse system stability in time and frequency domains.

CO4: Construct the state space model of Linear systems.

CO5: Identify and measure the Electrical and Non-Electrical quantities using appropriate instruments.

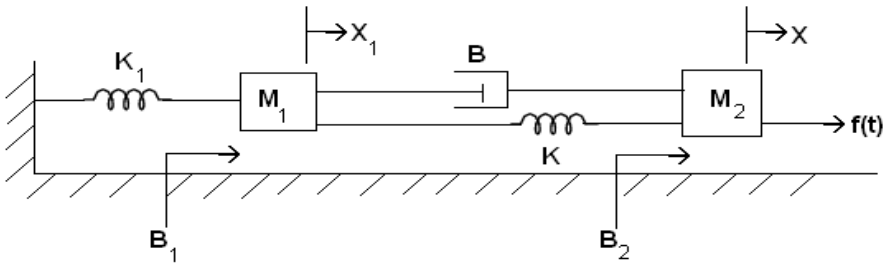
Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

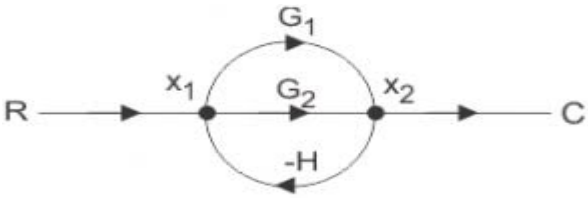
1.	What type of feedback signal is mostly used in control systems? why?	CO1	[K_1]
2.	Compare AC servo motor and DC servo motor.	CO1	[K_2]
3.	Classify the second order systems based on damping.	CO2	[K_1]
4.	Write the relationship between static and dynamic error constants.	CO2	[K_2]
5.	Mention the advantages of frequency response analysis.	CO3	[K1]
6.	List the frequency domain specifications.	CO3	[K_1]
7.	State Nyquist stability criterion.	CO3	[K_1]
8.	Discuss the effect of addition of poles and zeros on system response.	CO5	[K_2]
9.	What are the advantages of state space analysis?	CO4	[K_1]
10.	Define Controllability.	CO4	[K_1]

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

11.	a)	Write the differential equations governing the mechanical system shown in figure and determine the transfer function X(s) / F(s).	12	CO1	[K3]



b) Use Mason's gain formula to find the transfer function of the given signal flow graph — 4 — CO1 — [K3]



12. a) A unity feedback control system has an loop transfer function, G(s) = K/s(s+10). Determine the gain, so that the system will have a damping ratio of 0.5 for this value of K. Find settling time, percentage peak overshoot, and peak time for a unit step input. — 12 — CO2 — [K3]

b) For a unity feedback control system, the open loop transfer function G(s) = 10(s+2) / s^2(s+1). Find (a) position, (b)velocity and (c)acceleration error constants. — 4 — CO2 — [K3]

13. The open loop transfer function of a unity feedback system is given by G(s)=20 /s(1+3s)(1+4s). Draw the bode plot and find the gain margin and phase margin. — 16 — CO2 — [K3]

14. a) Construct the Routh array and determine the stability of the following system represented by the characteristics equations $s^6+2s^5+8s^4+12s^3+20s^2+16s+16 = 0$. — 12 — CO3 — [K3]

b) Write the procedure for Constructing the Nyquist plot. — 4 — CO3 — [K2]

15. a) A feedback system has a closed loop transfer function.
Y(s) / U(s) = 10 (s+4) / s (s+1) (s+3).
Obtain the state model for the given transfer function . — 8 — CO4 — [K3]

b) Check the controllability for following transfer function Y(s) /U(s)=10/s(s+1) (s+2). — 8 — CO4 — [K3]

16. Sketch the root locus for the open loop transfer function of unity feedback system given by G(S) = K / s (s^2 + 4s+ 13) . — 16 — CO3 — [K3]

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