Reg. No.												

Question Paper Code	12376

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

Fourth Semester

Electronics and Instrumentation Engineering

(Common to Instrumentation and Control Engineering)

20ICPC401 - CONTROL SYSTEMS

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Define Transfer function.	*2,K1,CO1*
2.	What is block diagram? What are the basic components of block diagram?	*2,K2,CO1*
3.	Define parabolic signal.	*2,K1,CO2*
4.	Define Steady state error.	*2,K1,CO2*
5.	Define gain Margin.	*2,K1,CO3*
6.	What is phase and gain cross over frequency?	*2,K2,CO3*
7.	Define BIBO Stability and mention its requirement.	*2,K2,CO4*
8.	What is auxiliary polynomial?	*2,K2,CO4*
9.	What is compensator? What are the different types of compensator?	*2,K1,CO5*
10.	Draw the S-plane representation of lead compensator.	*2,K2,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) Write the differential equations of the mechanical system shown in fig and draw the force-voltage & force -current analogous circuit and verify by writing Mesh and Nodal equations. *13,K3,CO1*

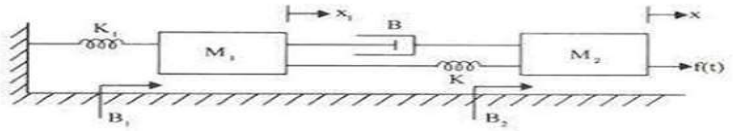

Figure 1

OR

b) Obtain the closed loop transfer function C(S) / R(S) using block diagram reduction techniques. *13,K3,CO1*

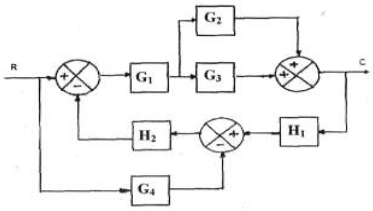

Figure 2

12. a) Derive the expressions for Time domain specifications with unit step input. *13,K3,CO2*

OR

b) A positional control system with velocity feedback is shown in fig. What is the response of the system for unit step input. Given that ζ = 0.5. Also calculate rise time, peak time, maximum overshoot and settling time. *13,K3,CO2*

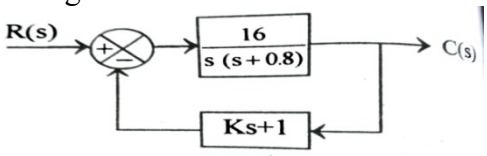

Figure 3

13. a) Sketch the bode plot for the unity fed back control system with transfer function and determine phase margin and gain margin. $G(s) = 75(1+0.2s)/s(s^2+16s+100)$ *13,K3,CO3*

OR

b) Sketch the polar plot for the following transfer function and find Gain margin and Phase margin.$G(S)= 1/s^2(1+s)(1+2s)$ *13,K3,CO3*

14. a) Construct Routh array and determine the stability of the system whose characteristic equation is $s^5+s^4+2s^3+2s^2+3s+5=0$. Comment on the location of the roots of characteristics equation. *13,K3,CO4*

OR

b) Construct the Nyquist plot for a system whose open loop transfer function is given by $G(s)H(s)= K(1+s)^2/s^3$. Find the range of K for stability. *13,K3,CO4*

15. a) Write the procedure for design of lag compensator using bode plot. *13,K3,CO5*

OR

b) Consider a unity feedback system with open loop transfer function G)s)= K/s(s+8). Design a lead compensator to meet the following specifications. (i) Percentage peak overshoot=9.5% (ii) Natural frequency of oscillation = 12 rad/sec (iii) Velocity error constant Kv≥ 10. *13,K3,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Sketch the root locus for the unity feedback system whose open loop transfer function is $G(s)= K/s(s+4)(s^2+4s+20)$. *15,K3,CO4*

OR

b) Write the procedure for design of lag –lead compensator using bode plot. *15.K3,CO5*