Reg. No.													

Question Paper Code	12078

12.4 JUL 2023

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

Fourth Semester

Electrical and Electronics Engineering

20EEPC404 - CONTROL ENGINEERING

(Regulations 2020)

(Use of Ordinary, Polar and Semi-log Graph sheets are permitted)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

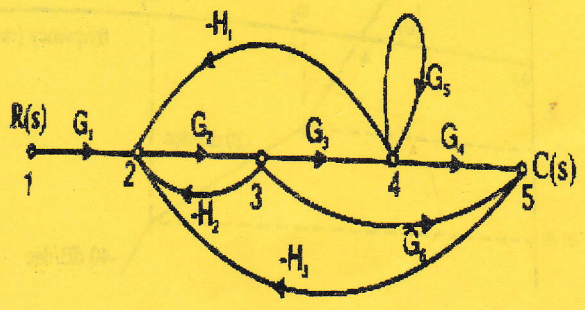
Answer ALL Questions

		Marks, K-Level, CO
1.	Outline Mason's Gain formula.	*2,K2,CO1*
2.	What are the advantages and disadvantages of open loop systems?	*2,K1,CO1*
3.	List the static error constants.	*2,K1,CO2*
4.	A 2nd order system has a damping ratio of 0.6 and natural frequency of oscillation is 10 rad/sec. Interpret the value of damped frequency of oscillation.	*2,K2,CO2*
5.	Recall root locus.	*2,K1,CO3*
6.	How is the centroid calculated?	*2,K1,CO3*
7.	Define phase crossover frequency.	*2,K1,CO4*
8.	Infer the Nyquist stability criterion.	*2,K2,CO4*
9.	Find the Transfer function of Lag Compensator.	*2,K1,CO5*
10.	Write the need of compensators and list types of compensators.	*2,K1,CO5*

PART - B (5 × 13 = 65 Marks)

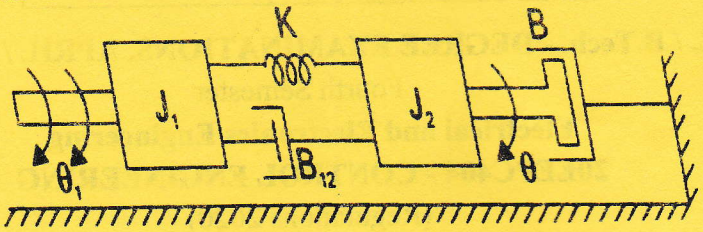
Answer ALL Questions

11. a) Use Mason's gain formula for determining the overall T.F. of the system shown. *13,K2,CO1*



OR

b) Utilize the differential equations governing the mechanical rotational system and Obtain the transfer function of the system. *13,K3,CO1*



12. a) Build the expression of steady state error and Static error Coefficients for various types of inputs. *13,K3,CO2*

OR

b) The response of a servo mechanism is **c(t) = 1+0.2e^-60t-1.2e^-10t** when subject to a unit step input. Obtain expression for **C(s)/R(s)** and also determine the Un-damped natural frequency of oscillation and damping ratio. *13,K3,CO*

13. a) A Control system **has G(S) = K / S (S^2 + 4S+13). H(s) = 1.** Develop and sketch the root locus. *13,K3,CO3*

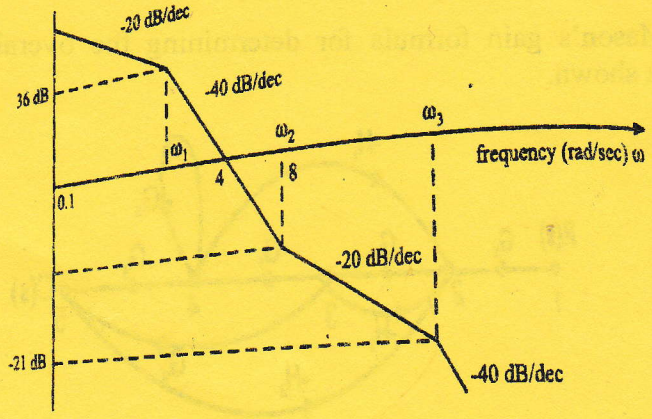
OR

b) Utilize Routh-Hurwitz criterion and determine the stability of a system whose characteristic equation is: **S^6 +2S^5 + 8S^4 +12S^3+ 20S^2 + 16S + 16 =0.** Comment on the Location of roots. *13,K3,CO3*

14. a) A Unity Feedback system has **G(s) = 1/ S^2 (1+S) (1+2S).** Sketch and make use of Polar plot to determine the Gain Margin and Phase Margin. *13,K3,CO4*

OR

b) Experiment with the given Magnitude Plot and determine the Transfer function of the system. *13,K3,CO*



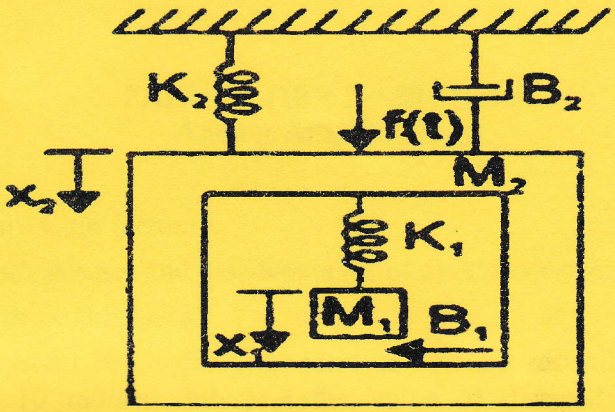
15. a) Organize the procedure for design of Lag-Lead Compensator using Root Locus. *13,K3,CO5*

OR

b) Plan the design of Lead Compensator using Bode's plot. *13,K3,CO5*

PART - C (1 x 15 = 15 Marks)

16. a) Write the differential equation governing the mechanical translational system. Model the F-V & F-I Analogous circuit and verify by writing Mesh and Node Equations. *15,K3,CO1*



OR

b) Design a lead compensator for a unity feedback system with open loop transfer function, G(S) = K/[S(S+1)(S+5)] to satisfy velocity error constant ≥ 50 and phase margin ≥ 20°. *15,K3,CO5*