Reg. No.												

Question Paper Code	12482

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

Fourth Semester

Electrical and Electronics Engineering

20EEPC404 - CONTROL ENGINEERING

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Write Mason's Gain formula.	*2,K1,CO1*
2.	Give some examples of control systems.	*2,K1,CO1*
3.	Distinguish between Type and Order of the system.	*2,K2,CO2*
4.	What is a PI Controller?	*2,K1,CO2*
5.	What is root locus?	*2,K1,CO3*
6.	What is the dominant pole?	*2,K1,CO3*
7.	Define gain margin.	*2,K1,CO4*
8.	State Nyquist stability criterion.	*2,K1,CO4*
9.	Draw the circuit of the lead compensator and draw its pole zero diagram.	*2,K2,CO5*
10.	Write the need of compensators and list types of compensators.	*2,K2,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) Write the differential equations governing the mechanical rotational system as shown in Figure 1. Draw the torque-voltage and torque current electrical analogous circuits and verify by writing mesh and node equations. *13,K3,CO1*

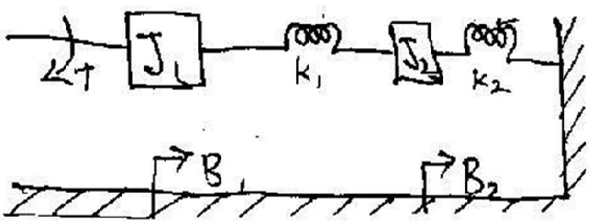

Figure 1

OR

b) Write the differential equations governing the mechanical rotational system as shown in Figure 2. Obtain the transfer function of the system. *13,K3,CO1*

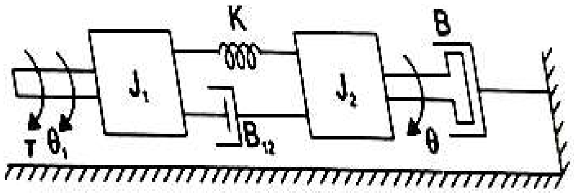

Figure 2

12. a) Explain the Time Domain Specifications. *13,K2,CO2*

OR

b) For a UFB Control System the OLTF is $\frac{10(s+2)}{s^2(s+1)}$. Determine the static error coefficients and ess when $R(S)=\frac{3}{s}-\frac{2}{s^2}+\frac{1}{3s^3}$. *13,K3,CO2*

13. a) A UFB Control system has an OLTF of $G(S)=\frac{K}{s(s^2+4s+13)}$. Sketch the root locus. *13,K3,CO3*

OR

b) Using the Routh-Hurwitz criterion determines stability of a system whose characteristic equation is $s^4+8s^3+18s^2+16s+5=0$. Comment on the Location of roots. *13,K3,CO3*

14. a) The OLTF of a UFB system is $G(S)=\frac{1}{s(s+1)(1+2s)}$. Sketch the Polar plot and determine the Gain Margin and Phase Margin. *13,K3,CO4*

OR

b) Sketch Bode plot for the transfer function and determine the gain crossover frequency. *13,K3,CO4*

$$G(S)=\frac{10}{s(1+0.4s)(1+0.1s)}$$

15. a) Write the procedure for Design of Lag-Lead Compensator using Bode plot. *13,K2,CO5*

OR

b) Write the procedure for design of Lag Compensator using Root Locus. *13,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Construct a suitable lag compensator so that phase margin is 40° and the steady state error for ramp input is less than or equal to 0.2 for a unity feedback system having an open loop transfer function of *15,K3,CO5*

$$G(S) = \frac{K}{s(1+2s)}$$

OR

b) Design a lead compensator for a unity feedback system with open loop transfer function, $G(S) = \frac{K}{s(s+1)(s+5)}$ to satisfy velocity error constant ≥ 50 and phase margin $\geq 20^{o}$. *15,K3,CO5*