Reg. No.															

Question Paper Code	12881

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Fifth Semester

Electronics and Communication Engineering

20ECEL508 - CONTROL SYSTEMS ENGINEERING

Regulations - 2020

(Use of Semilog, Polar and Linear Graphs is permitted)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

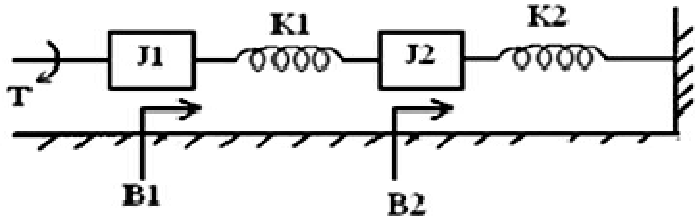
Answer ALL Questions

		Marks	K – Level	CO
1.	Distinguish between open loop and closed loop system.	2	K2	CO1
2.	Write the expression for transfer function of a control system.	2	K1	CO1
3.	Name the test signals used in control system.	2	K1	CO3
4.	Why derivative controller is not used separately in control applications?	2	K2	CO3
5.	Define Phase margin.	2	K1	CO4
6.	State the advantages of Nyquist method of stability analysis.	2	K1	CO4
7.	Give any two limitations of Routh stability criterion.	2	K1	CO5
8.	What is relative stability?	2	K1	CO5
9.	What is the need for compensation?	2	K1	CO6
10.	What do you meant by controllability?	2	K1	CO6

PART - B (5 × 13 = 65 Marks)

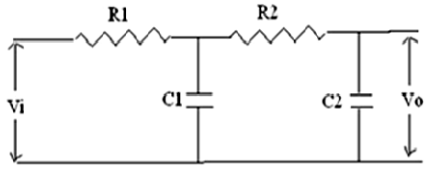
Answer ALL Questions

			Marks	K – Level	CO
11.	a)	Write down the differential equation governing mechanical rotational system shown fig. Draw the torque voltage and torque current electrical analogous circuit.	13	K2	CO1



OR

	b)	Determine the transfer function of the network in fig.	13	K2	CO1



12. a) Obtain the response of unity feedback system whose open loop transfer function is $G(s) = \frac{4}{s(s+5)}$ and when the input is unit step. *13 K2 CO3*

OR

b) A unity feedback control system has an open loop transfer function $G(s) = \frac{10}{s(s+2)}$.Find the rise time, percentage overshoot, peak time and settling time for a step input of 12 units. *13 K2 CO3*

13. a) Evaluate open loop transfer function of a unity feedback system given by $G(s) = \frac{1}{s(1+s)(1+2s)}$. Sketch the polar plot and determine the gain and phase margin. *13 K3 CO4*

OR

b) Draw the Bode plot showing the magnitude in decibels and phase angle in degrees as a function of log frequency for the transfer function. $G(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}$. From the Bode plot, estimate the gain cross-over frequency. *13 K3 CO4*

14. a) Determine the stability of the system by using Routh stability criterion for the equation $9S^5-20S^4+10S^3-S^2-9S-10 = 0$. Identify the location of the roots and comment. *13 K3 CO5*

OR

b) Sketch the root locus of a unity feedback system having transfer function$G(s) = \frac{K}{S(s^2+4s+13)}$ *13 K3 CO5*

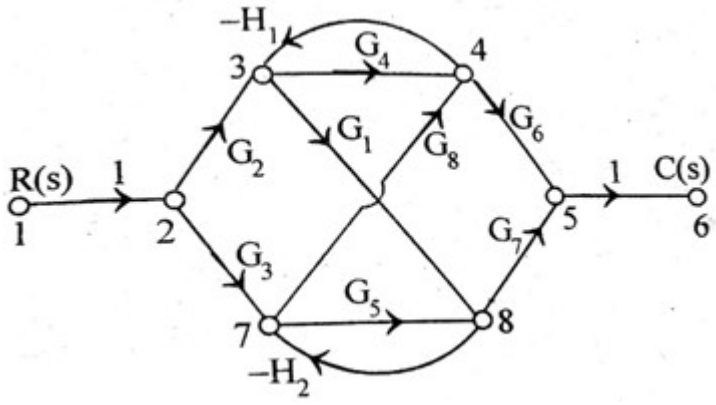
15. a) Design a suitable lag compensator so that phase margin is 40^0 and the steady state error for ramp input is less than or equal to 0.2, for a unity feedback system with open loop transfer function $G(s) = \frac{K}{s(1+2s)}$. *13 K3 CO6*

OR

b) Discuss the procedure adhere to device a lag compensator using bode plot. *13 K3 CO6*

PART - C (1 × 15 = 15 Marks)

16. a) Using the mason's gain formula determine the transfer function of the following system: *15 K3 CO2*



OR

b) Evaluate the transfer function of the system by reducing the given block diagram. *15 K3 CO2*