Reg. No.															

Question Paper Code	13472

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Fourth Semester

Mechanical Engineering

20MEPC401 - MEASUREMENT AND CONTROL SYSTEMS

Regulations - 2020

(Use of semi log and polar graph is permitted)

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following is the static performance characteristics? (a) Speed of response (b) Lag (c) Fidelity (d) Sensitivity	1	K1	CO1
2.	Which of the following is a measure of the spread of data? (a) Mean (b) Median (c) Range (d) Mode	1	K1	CO1
3.	Open loop control systems are (a) Stable (b) Unstable (c) More maintenance (d) Having feedback	1	K1	CO2
4.	What is/ are the basic elements used in block diagram? (a) Block (b) Summing point (c) Branch point (d) All of the mentioned	1	K1	CO2
5.	A critically damped system has a damping ratio (ζ) of (a) $\zeta < 1$ (b) $\zeta = 1$ (c) $\zeta > 1$ (d) $\zeta = 0$	1	K1	CO3
6.	The velocity error constant (Kv) is used for (a) Step input (b) Ramp input (c) Parabolic input (d) Sinusoidal input	1	K1	CO3
7.	A Polar plot represents (a) Gain and phase together in a complex plane (b) Time response (c) Bode plot information (d) Stability margin	1	K1	CO4
8.	The Bode plot consists of (a) Gain and phase plots (b) Time and frequency plots (c) Magnitude and time plots (d) Phase and time plots	1	K1	CO4
9.	Which torque measurement method is used for rotating shafts? (a) Inline stationary (b) Proximity type (c) Inline rotating (d) Hydraulic method	1	K1	CO5
10.	A thermocouple generates an EMF based on the (a) Seebeck effect (b) Peltier effect (c) Joule effect (d) Hall effect	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Compare systematic and random error.	2	K2	CO1
12.	What do you mean by curve fitting?	2	K1	CO1
13.	Distinguish between open-loop and closed-loop systems.	2	K2	CO2
14.	Write the Mason's gain formula.	2	K1	CO2
15.	Define rise time.	2	K1	CO3
16.	Discuss about time response.	2	K2	CO3
17.	Compare bode plot and polar plot.	2	K2	CO4
18.	Mention the frequency domain specifications.	2	K1	CO4
19.	Write the principle of LVDT.	2	K1	CO5
20.	List the advantages of LVDT accelerometer.	2	K1	CO5
21.	What are the types of pyrometers?	2	K1	CO6
22.	List any four applications of temperature measurement.	2	K1	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain the various types errors in detail with suitable example.	*11*	*K2*	*CO1*
		OR			
	b)	Discuss the statistical analysis of data recorded in the measurement system.	*11*	*K2*	*CO1*
24.	a)	Determine the overall transfer function C(S)/ R(S) for the system shown in figure 1.	*11*	*K3*	*CO2*

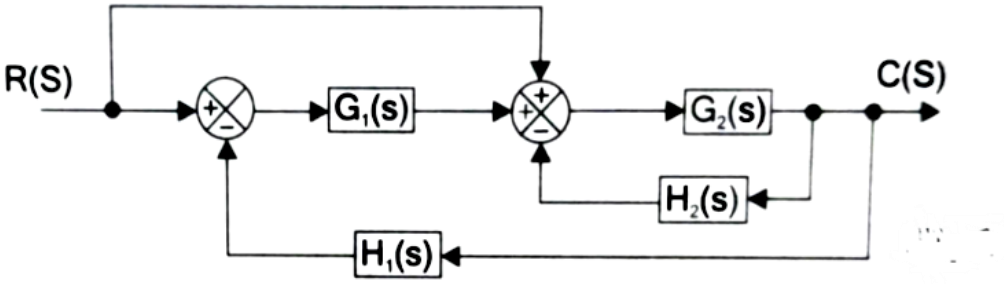

Figure 1

OR

	b)	Find the overall transfer function of the system whose signal flow graph is shown in figure 2.	*11*	*K3*	*CO2*

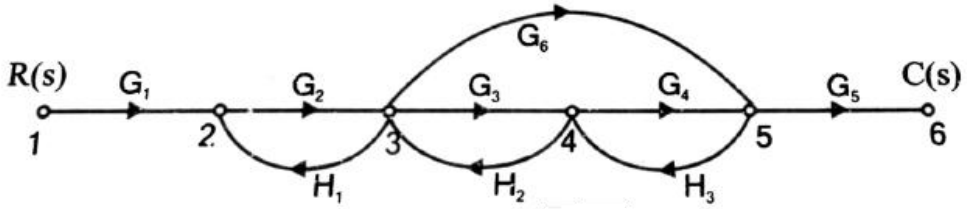

Figure 2

25.	a)	Derive the expression and draw the response of the first order system with unit step input.	*11*	*K3*	*CO3*
		OR			
	b)	The response of a servo mechanism is c (t) = 1+ 0.2 e^{-60t} -1.2 e^{-10t} when subject to a unit step input. Obtain an expression for closed loop transfer function. Determine the un damped natural frequency and damping ratio.	*11*	*K3*	*CO3*
26.	a)	Sketch the bode diagram for following transfer function and obtain the gain and phase cross over frequencies. G(s) =10/[s(1+0.4s)(1+0.1s)].	*11*	*K3*	*CO4*
		OR			
	b)	The open loop transfer function of a unity feedback system is given by G(S) =1/[S(1+S)(1+2S)]. Sketch the polar plot and determine the gain margin and phase margin.	*11*	*K3*	*CO4*
27.	a)	Discuss the LVDT for displacement measurement in detail with a neat sketch.	*11*	*K2*	*CO5*
		OR			
	b)	Explain the working of in-line rotating torque measurement with a neat diagram.	*11*	*K2*	*CO5*
28.	a)	Explain the helix and spiral-type bimetallic thermometer with a neat sketch.	*11*	*K2*	*CO6*
		OR			
	b)	Explain how a pressure gauge is calibrated using a dead-weight tester with a suitable diagram.	*11*	*K2*	*CO6*