Reg. No.												

Question Paper Code	11658

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Fourth Semester

Mechanical Engineering

20MEPC401 - MEASUREMENT AND CONTROL SYSTEMS

(Regulations 2020)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Why instrument Calibration is necessary?	2,K1,CO1
2.	Define Time Constant.	2,K1,CO1
3.	Define the term Static Sensitivity in respect of Zeroth Order System.	2,K1,CO2
4.	Outline the procedure that could be used to tune a control system.	2,K1,CO2
5.	What is meant by proportional action in a Process Controllers?	2,K1,CO3
6.	Why is an uncertainty analysis important in the preliminary stages of experimental planning?	2,K1,CO3
7.	Specify the transducers which could be used for the following information change. (i) Angular Position of a shaft to pulses of light (ii) Displacement to Potential difference	2,K2,CO4
8.	State the working principle of a Load Cell.	2,K1,CO4
9.	Distinguish between gauge pressure, absolute pressure and vacuum.	2,K2,CO5
10.	Name the most commonly used instruments for temperature control.	2,K1,CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	(i) Define Hysteresis and Dead Zone. (ii) Two resistances are connected in series and parallel. The values of the resistances are R1=100.0±0.3Q, R2=50+0.2Q. Calculate the equivalent resistance and its uncertainty in each of these cases. A 9 V battery is connected across the two resistance arrangements. What are the currents and the uncertainties in each case?	4,K1,CO1 9,K1,CO1
		OR	
	b)	(i) Define the term "Accuracy", "Precision", "Range", and "Span". (ii) Describe Reproducibility and Repeatability.	8,K1,CO1 5,K1,CO1
12.	a)	(i) Draw a block diagram of closed loop control system. Describe its working for motor speed control. (ii) State the advantages of using AC Servo motors.	11,K2,CO2 2,K1,CO2

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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OR

b) Explain the concept of using servo motors in mechanical, electrical, electronic and pneumatic control system with examples. *13,K2,CO2*

13. a) Describe and compare the characteristics of (i) Proportional Control (ii) Proportional plus integral Control (iii) Proportional plus integral plus derivative Control. *13,K2,CO3*

OR

b) Discuss various types of transducers commonly used in Engineering applications based on their output, operating principle and its typical applications along with its reported accuracy level. *13,K2,CO3*

14. a) Discuss the following transducers with neat sketch (i) LVDT (ii) Capacitive transducers (iii) Piezo electric transducers (iv) Photoelectric transducers. *13,K2,CO4*

OR

b) (i) Explain with neat sketch how load cell is used for strain measurements. *6,K2,CO4*

(ii) Explain the construction and principle of working of RVDT with the help of neat sketch. *7,K2,CO4*

15. a) (i) Explain various techniques used for the measurement of specific heat of both solid and liquid. *7,K2,CO5*

(ii) Draw a schematic of a bimetallic thermostat and indicate its various parts. *6,K2,CO5*

OR

b) (i) Explain the working principle of radiation pyrometer and discuss why emissivity is important in radiation temperature measurement. *7,K2,CO5*

(ii) Draw labelled sketch of liquid in glass thermometer. *6,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Distinguish between open-loop and closed loop control systems with the help of suitable schematic and identify the system parameters and components in each case, also describe a typical closed-loop control system to control the following processes. (i) the volume flow rate in a pipe arrangement (ii) the speed of an automobile vehicle. *15,K2,CO3*

OR

b) Design a measurement system part of the control system for a furnace. It is necessary to monitor the rate at which the heating oil flows along a pipe. The output from the measurement system is to be an electric signal which can be used to adjust the speed of the oil pump. The system must be capable of operating continuously and automatically without adjustment for long periods of time. Also discuss the economics of the same. *15,K2,CO5*