Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - VI EXAMINATION - WINTER 2025

Subject Code: 3160620 **Date: 19-11-2025**

Subject Name: Instrumentation and Sensors

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Define measurement and instrumentation. List different types of sensors used in engineering applications.	**03**
	(b)	Explain the characteristics of an ideal transducer.	**04**
	(c)	Explain the working principle of strain gauge and its application.	**07**
Q.2	**(a)**	What is calibration of sensors? Explain its importance.	**03**
	(b)	Explain the procedure for sensor installation and configuration.	**04**
	(c)	Draw and explain the block diagram of a data acquisition system (DAQ).	**07**
		OR	
	(c)	Explain in detail the various sources of measurement errors and their minimization.	**07**
Q.3	**(a)**	Define mean, median, and mode with examples.	**03**
	(b)	Explain the concept of frequency domain signal analysis.	**04**
	(c)	Explain the working and applications of piezometer and inclinometer.	**07**
		OR	
	(a)	Discuss the process of data reduction and interpretation using statistical tools.	**03**
	(b)	Explain the need for sensor selection in instrumentation systems.	**04**
	(c)	Explain measurement uncertainty with an example.	**07**
Q.4	**(a)**	Explain the role of FFT in noise reduction with a suitable example.	**03**
	(b)	Explain the concept of measurement uncertainty propagation in instrumentation.	**04**
	(c)	Describe the importance of data filtering techniques in signal conditioning.	**07**
		OR	
	(a)	Explain the need for frequency domain analysis.	**03**
	(b)	Write a short note on leakage and frequency resolution.	**04**

	(c)	List any two light sensors and explain them.	**07**
Q.5	**(a)**	Differentiate between analog and digital signal processing.	**03**
	(b)	Write short note on case study: use of sensors in structural health monitoring.	**04**
	(c)	Design a conceptual instrumentation system for monitoring vibrations in a tall building.	**07**

OR

	(a)	Define signal conditioning. Why is it needed?	**03**
	(b)	Write a note on measurement system design considerations.	**04**
	(c)	Explain time-domain and frequency-domain signal processing comparison.	**07**

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