Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2023

Subject Code:3161008 Date:12-07-2023

Subject Name:Sensors and Transducers

Time:10:30 AM TO 01:00 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: (1) Sensitivity (2) Precision (3) Accuracy.	**03**
	(b)	Write short note on Limiting Errors.	**04**
	(c)	A 0-150 V voltmeter has a guaranteed accuracy of 1% of full scale reading. The voltage measured by this instrument is 75 V. Calculate the limiting error in percent. Comment upon the result.	**07**
Q.2	**(a)**	How a thermistor differs from a thermocouple as a temperature sensor?	**03**
	(b)	Write advantages and disadvantages of Thermistor.	**04**
	(c)	Explain the construction and working principle of potentiometer. Evaluate its application as motion sensor.	**07**
		OR	
	(c)	Explain working of LVDT with advantages and disadvantages.	**07**
Q.3	**(a)**	Write down the characteristics of Strain Guage.	**03**
	(b)	State advantages of Fiber Optic Sensor and its applications.	**04**
	(c)	Explain the working of Piezoelectric Sensors. List the advantages and disadvantages of Piezoelectric Sensors.	**07**
		OR	
Q.3	**(a)**	Explain Magneto Resistive Effect.	**03**
	(b)	Define dark resistance and list out various materials used for the construction of LDR.	**04**
	(c)	State the working principle of Optic Fiber sensor. With example explain optic fiber sensor configuration.	**07**
Q.4	**(a)**	Draw an Inverting Amplifier using Op-Amp and derive formula for its gain.	**03**
	(b)	Write down any four requirements of an Instrumentation Amplifier.	**04**
	(c)	Explain the Kelvin Double bridge method for measurement of Low resistance.	**07**
		OR	
Q.4	**(a)**	Write down applications of attenuators.	**03**
	(b)	Suggest suitable detectors for AC bridges for the following frequency ranges. (1) 250 Hz to 4 KHz (2) Below 200 Hz (3) 10 Hz to 100 KHz.	**04**
	(c)	Discuss working of Maxwell's Bridge for measurement of Inductance. For what range of Q- factor of the coil, the bridge is suitable?	**07**
Q.5	**(a)**	Define Resolution and Quantization terms in context of A/D Converters.	**03**
	(b)	A control valve has a linear variation of opening as the input votage varies from 0 to 10 V. A microcomputer outputs an 8-bit output word to control valve opening using an 8 bit D/A converter to generate the valve voltage.	**04**

(1) find the reference voltage required to obtain full value opening (10 V)
(2) find percentage of valve opening for a 1 bit change in the input word.

(c) An analog transducer with a 0-10 V input is able to distinguish a change of 10 mV in its input signal. (1) calculate its resolution (2) Calculate the number of bits of an A/D converter so that the digital output has almost the same resolution as the transducer. The A/D converter uses a binary code. Calculate also (3) the quantization error and (4) the number of decision levels. **07**

OR

Q.5 **(a)** Give three comparisons between Weighted Resistor DAC and R-2R ladder DAC. **03**

(b) Draw a Sample and Hold Circuit. **04**

(c) Explain Successive Approximation Type A/D Converter with suitable block diagram. **07**

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