## **GUJARAT TECHNOLOGICAL UNIVERSITY** BE - SEMESTER-V • EXAMINATION – WINTER 2013

Subj Subj	ject	Code: 151702 Date: 04-12-2013	
Subj Tim Instru	e: 1(	).30 am - 01.00 pm Total Marks: 70	
	1. 2. 3.	Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.	
Q.1	(a)	i) A $0 - 200$ V voltmeter has an accuracy of $\pm 0.5\%$ . What is accuracy when measuring 100 V and 20 V	03
		<ul> <li>ii) A thermometer having a time constant of 10 s at room temperature of 35 <sup>o</sup>C is suddenly dipped in cold water at 5 <sup>o</sup>C. Estimate the time at which the thermometer reads 10 <sup>o</sup>C</li> </ul>	04
	<b>(b)</b>	i) A first order instrument has a time constant of 2 sec. What is the span of	03
		frequencies for which it will respond within 5% accuracy?	04
		<ul> <li>Find its resistance at 65 °C if the temperature co-efficient of 0.00392/°C.</li> </ul>	04
		• If the thermometer has a resistance of 150 $\Omega$ , calculate the temperature.	
Q.2	(a)	Define measurement, Instrument, Instrumentation and Calibration. Explain Why we do measurement? (what is need of measurement)	07
	(b)	In given figure We use PT 100 RTD with temperature co-efficient of 0.385 $\Omega$ / °C and the value of power supply is Vs = 5 V and the value of resistance of bridge are : R1, R2=1K $\Omega$ , R3= 116 $\Omega$ and R <sub>RTD</sub> = 100 $\Omega$ .	07
		<ul> <li>If galvanometer indicate zero then find out lead resistance ( assume lead resistance of A,B are equal ) and its equivalent temperature error in measurement.</li> </ul>	
		<ul> <li>If Lead resistance Ra,Rb= 5 Ω, Temp the RTD measure is 80°C.Find the value of Output voltage Vo.</li> </ul>	
		$R_1 \rightarrow R_3$ $r \rightarrow DVM - A$	

- (b) i) A hall effect transducer is used for the measurement of a magnetic field 03 of 0.5 Wb/m<sup>2</sup>. The 2 mm thick slab is made of bismuth for which the hall's co-efficient is  $-1 \times 10^{-6}$  V m/(A-Wb/m<sup>2</sup>) and the current is 3A. Find hall effect outpout voltage.
  - ii) A resistance wire strain gauge with a gauge factor of 2 is bonded to a steel structural member subject to a stress of  $100 \text{ MN/m}^2$ . The elastic modulus of steel is  $200 \text{ GN/m}^2$ . Calculate the percentage change in the value of the gauge resistance due to the applied stress. Give you comment on the result.

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Q.3 (a) Explain concept of Resistive Strain Transducer with its basic equation. Also 07 Draw and Explain strain gauge whetstone bridge circuits for temperature compensation using one active and one dummy strain gauge, two active gauge on the same side, two active opposite sides.

(b) List out various inductive transducer. Explain LVDT with displacement- 07 voltage characteristic and necessary equation.

## OR

- Q.3 (a) Explain Capacitive level transducer for use in insulating and conducting 07 liquids, for use in conducting liquid only and give its equivalent capacitance circuit.
  - (b) Explain hot wire resistive transducer. Also explain how hot wire resistive 07 transducer can use for measurement of level with necessary figure and operation.
- Q.4 (a) Explain Magnetostrictive phenomenon with all details. List out various 07 magnetostrictive transducer.
  - (b) List out various piezoelectric transducer. Explain piezoelectric strain 07 transducer.

## OR

- Q.4 (a) Explain Hall Effect transducer and given it's application.
  - (b) What you mean by electrochemical transducer? Explain how we measure pH 07 with glass and reference electrode.
- Q.5 (a) Give the advantage of active filter over passive filter. Explain first order low 07 pass butterworth active filter with necessary circuit diagram, frequency response and equation for gain and phase.
  - (b) What is need of signal conditioning/processing circuit as next stage of **07** sensors/transducers? Explain any one sensor/transducer with its appropriate signal conditioning. Justify you signal conditioning for your sensor/transducer.

## OR

- Q.5 (a) Explain the basic concept of analog multiplexer and de-multiplexer with circuit 07 and operation. Also list out it's application.
  - (b) Explain oscillator principle with block diagram and necessary feedback gain 07 condition. Given the application of various oscillator and signal generators in brief.

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