

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (New) EXAMINATION – WINTER 2019****Subject Code: 2162005****Date: 09/12/2019****Subject Name: Electro Mechanical Measurements & Instruments****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.

		MARKS
Q.1	(a) Explain briefly the selection criterion of transducers for industrial applications.	03
	(b) Explain different types of errors generated during measurement.	04
	(c) What is a measuring instrument? Give detail classification of measuring instruments.	07
Q.2	(a) Explain the “Static calibration Process” giving suitable example.	03
	(b) With neat sketch explain Hand Speed Mechanical Tachometer.	04
	(c) Prove that sensitivity of Column Type Load Cell (Strain Gauge load Cell) is, $2(1+\mu)$ higher than the highest sensitivity is achieved through the single active strain gauge in quarter bridge circuit.	07
	OR	
	(c) Explain various principle of operations of capacitive transducer with suitable diagrams.	07
Q.3	(a) Explain the working principle of “Stroboscope” with suitable sketch.	03
	(b) Explain with block diagram: RTD as a measurement system.	04
	(c) Define the following for a measuring instrument: (I) Indicated Value (II) Range (III) Speed of Response (IV) Sensitivity (V) Dead Zone (VI) Tolerance (VII) Span and Range.	07
	OR	
Q.3	(a) List the advantages and disadvantages of PMMC type instruments.	03
	(b) A $120\ \Omega$ resistance strain gauge having a gauge factor of 2.0 has been mounted on a steel bar, and it forms one arm of symmetrical Wheatstone bridge circuit. When the steel bar is subjected to a tensile load, the output indicator indicates an output voltage equivalent to 5mV. Workout the mechanical strain if the gauge specifications supplied by the manufacturer indicate an operating current of 15mA. .	04
	(c) What is “Standardization” of a D.C. potentiometer and explain the “Standardization Process” for the same in detail with suitable example.	07
Q.4	(a) An analog voltmeter with scale range of 0.0-5.0 V shows a voltage of 2.65 V. The true value of a voltage is 2.70 V. Determine the	03

values of absolute error and correction, also express the error as a function of the true value and full scale deflection.

- (b) With schematic diagram explain optical torsion meter. **04**
- (c) With schematic diagram explain Eddy Current and Rope Brake dynamometers. **07**

OR

- Q.4**
- (a) Explain briefly the Attraction type Moving Iron instrument with neat sketch. **03**
 - (b) A Resistive potentiometer is rated as $200\ \Omega$, $1\ \text{W}$ (derate at $10\text{mW}/^\circ\text{C}$ above 60°C), $30\ ^\circ\text{C}/\text{W}$ thermal resistance. It is used with $10\ \text{V}$ supply at 70°C ambient temperature. Calculate: (i) The power dissipated by potentiometer (ii) Actual temperature of potentiometer and (iii) Power dissipation allowed. Can the potentiometer be used safely under the above conditions? **04**
 - (c) Explain the construction and working principle of LVDT with its advantages and disadvantages. **07**
- Q.5**
- (a) A pressure gauge reads $32.12\ \text{bar}$ for true value of $31.58\ \text{bar}$. Determine the static error and static correction. **03**
 - (b) Explain in detail the input-output configuration of measuring instrument. **04**
 - (c) Explain in detail the second order system responses for step, ramp and sinusoidal inputs. **07**

OR

- Q.5**
- (a) Explain briefly that why cold junction compensation is required in thermocouples with suitable example. **03**
 - (b) Derive the expression of bridge sensitivity for equal arms of Wheatstone bridge. **04**
 - (c) Draw the neat sketch of "Digital Data Acquisition System" and explain all its functional blocks. **07**
