Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2162005 **Date: 03/05/2017**

Subject Name: Electro Mechanical Measurements & Instruments

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.**

MARKS

Q.1 **Short Questions** **14**

1 A Wheatstone bridge cannot be used for precision measurements because errors are introduced in to on account of..
(a) Resistance of connecting leads (b) Thermo-electric emfs
(c) Contact resistances (d) All of the above

2 Which of the following is not a static characteristics of a measuring instrument
(a) Drift (b) Span
(c) Range (d) Overshoot

3 The temperature measurement by a thermocouple is
(a) Tertiary measurement (b) Secondary
(c) Primary measurement (d) None of above

4 What is the span of the pressure gauge if it is calibrated between 10 and 100 bar?

5 Stroboscope is used for measuring
(a) RPM (b) Velocity
(c) Speed (d) All of the above

6 A potentiometer is basically a :
(a) Deflectional type instrument (b) Null type instrument
(c) Deflactional & Null type instrument (d) A digital instrument

7 Find the percentage relative error if true value of variable is 9.80 units and static error is 0.06 units.

8 A 1 mA ammeter has a resistance of 100 Ω .It is to be converted to a 1A ammeter. The value of shunt resistance is:
(a) 0.001 Ω (b) 0.1001 Ω
(c) 100000 Ω (d) 100 Ω

9 A Megger is used for measurement of :
(a) Low resistances (b) Medium resistances
(c) Insulation resistances (d) All of the above

10 One of the following is an active transducer:
(a) Strain gauge (b) LVDT
(c) Photovoltaic cell (d) Thermistor

11 Define “Accuracy”.

12 Define “Transducer”.

13 Define “Seeback Effect”.

14 Can Piezo-electric transducer act as an inverse transducer?

Q.2 **(a)** Explain modes of measurement with examples. **03**

(b) Explain torque measurement using Rope Brake Dynamometer. **04**

(c) Describe the construction, working principle and output characteristics of LVDT with neat sketches. **07**

OR

(c) Explain how the current and voltage range of PMMC type instruments extended with the help of shunts and multipliers and draw neat sketches. **07**

Q.3 **(a)** Explain standards for measurement with examples. **03**

(b) Explain Input-Output configuration for measuring instrument. **04**

(c) Derive the mathematical expression for zero order, first order and second order measurement systems with suitable examples. **07**

OR

Q.3 **(a)** Explain temperature compensation in strain gauges using "Dummy gauge". **03**

(b) What is the need of lead wire resistance compensation in RTD and explain any one technique of it with neat diagram. **04**

(c) Draw equivalent circuits of piezo electric transducer and prove that it's steady state response is zero. **07**

Q.4 **(a)** Explain briefly the various principle of operation of capacitive transducers. **03**

(b) Prove that output voltage of piezoelectric transducer is given as $E_0 = gtp$. **04**

(c) Explain the construction and working principle of thermocouple with its advantages and disadvantages. **07**

OR

Q.4 **(a)** Explain mechanical tachometer with neat sketch. **03**

(b) Give detail classification of measuring instruments. **04**

(c) Define the following terms **07**
(I)Threshold (II) Precision (III) Repeatability (IV) Drift (V) Dead Zone (VI) Backlash (VII) Span

Q.5 **(a)** Discuss any one application of D.C. potentiometer. **03**

(b) A strain gauge has a gauge factor of 4.If the strain gauge is attached to a metal bar that stretches from 0.25m to 0.255m when strained, What is the percentage change in resistance? If the unstrained value of gauges 120 Ω, what is the resistance value of gauge after the application of strain? **04**

(c) List the different methods for measurement of high resistance and explain the same by using the Megger. **07**

OR

Q.5 **(a)** Explain applications of measurement. **03**

(b) An analog voltage measuring instrument with a 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 values of absolute error and related correction. Also express the error as a function of the true value and full scale deflection. **04**

(c) Following are the data taken while calibrating the bourdon tube pressure gauge with dead weight tester. **07**

Actual Pressure	5	10	15	20	25	30	25	20	15	10	05
Gauge Pressure	4.5	9.6	14.2	18	22.5	29	26	21	16.2	11.4	7

Draw calibration, error and correction curves. Also make suitable comments on the curves.

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